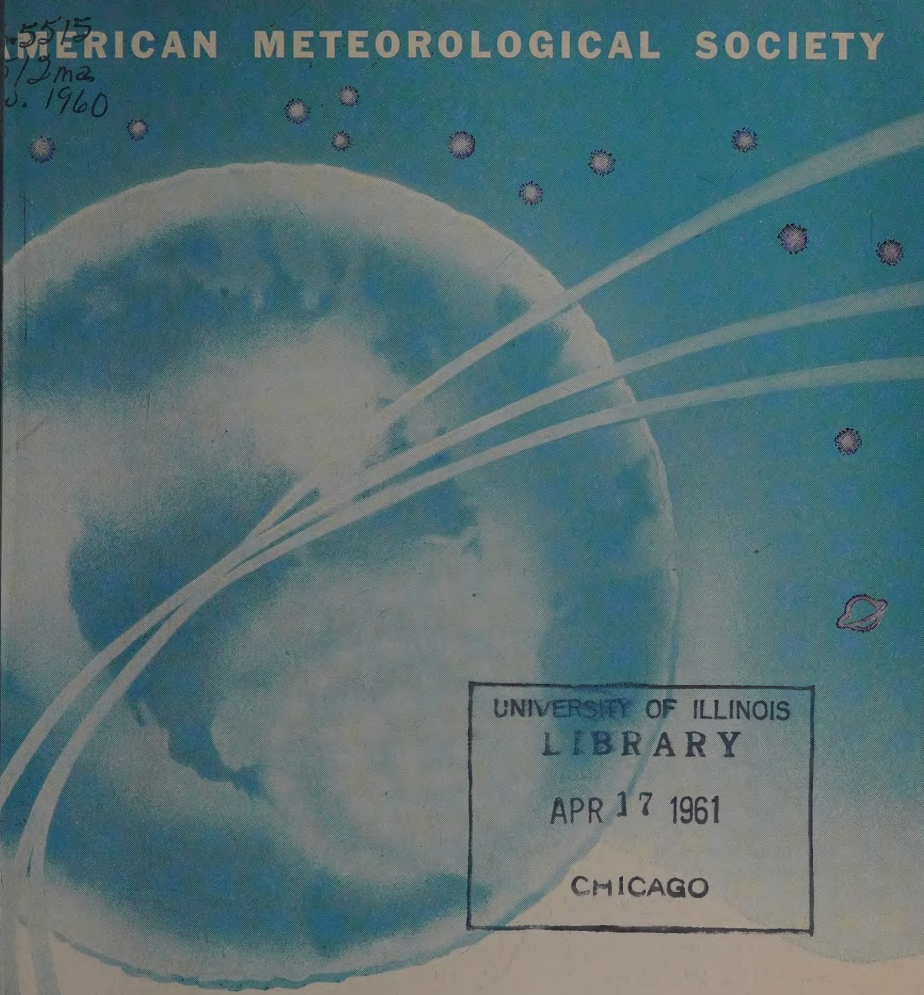
QC 851
.A512ma
v. 1960

AMERICAN METEOROLOGICAL SOCIETY



UNIVERSITY OF ILLINOIS
LIBRARY
APR 17 1961
CHICAGO

Meteorological & Geoastrophysical ABSTRACTS

Vol. 11 NOVEMBER 1960 No. 11

METEOROLOGICAL AND GEOASTROPHYSICAL ABSTRACTS

**Editor and Supervisor: MALCOLM RIGBY (Washington)
#Business Manager: KENNETH C. SPENGLER (Boston)
Corresponding Editor: *DR. ANDRE VANDENPLAS (Uccle, Belgium)
Corresponding Analyst: *DR. I. L. DORDICK (Chicago, Ill.)
Corresponding Analyst: *RONALD BAKER (Harrow, Eng.)

EDITORIAL STAFF (Washington)

Assistant Editor (Publications): MARY L. RICE
Chief Bibliographer (Accessions): GEZA THURONYI
Chief Cataloger: DOROTHY M. GROPP
Chief Indexer: *MARINA SZE
Technical Editor: HAFEEZ MALIK

Bibliography

ELEMER KISS
ANDREW J. MEGLIS
OTTO TABORSKY

Abstracting

EVELYN Z. SINHA
KIWON CHUNG
AHMED KHAN
NNDEM E. U. NNDEM
WILHELM NUPEN
*ALEXIS M. POUSHKIN
ISMAIL SAAD
*NICHOLAS P. SETCHKIN

Cataloging

*BEVERLY HUGHES
*BARBARA H. KING
*MARGARET MATTHEWS
*SHIRLEY PANARA
*LAURA I. PETERSON

Indexing

*MURIEL F. HAAS
*WINIFRED SCHRAITLE
*MARY B. DENNY
*SUSAN MANOVILL
*HELEN THURONYI
*RUSSELL G. CADY

Processing

*EDITH N. HAUPT
*DORIS G. NICKEY
*MILDRED CARROLL
*KATHERINE MARTINOFF
*HELEN I. RICKELS
*RUTH S. GARVEY

* Part time.

**EDITORIAL OFFICE: Washington, D. C. P.O. ADDRESS: Box 1736, Washington 13, D. C. Telephone: REpublic 7–6278.

#ADMINISTRATIVE OFFICE: American Meteorological Society, Office of Executive Secretary, 45 Beacon Street, Boston 8, Mass.

Address all business communications, orders and inquiries to the Executive Secretary, Mr. Kenneth C. Spengler, 45 Beacon Street, Boston 8, Mass. Exchanges and reprints may be sent direct to P. O. Box 1736, Washington 13, D. C.

METEOROLOGICAL AND GEOASTROPHYSICAL ABSTRACTS is a monthly publication devoted to:

A. Current Abstracts in English on important meteorological and geoastrophysical literature in every language.

B. Bibliographic references to other items of interest to the profession.

C. Selective, annotated bibliographies on subjects of immediate and special interest to meteorologists, geophysicists and astrophysicists.

SUBSCRIPTION RATE: $60 ($15.00 per year to members). Prices for single copies $10 ($5 to members); back issues $6 ($3 to members); back volumes $30 ($15 to members); Vol. 1–10 complete, $200 ($100 to members).

METEOROLOGICAL AND GEOASTROPHYSICAL ABSTRACTS

MALCOLM RIGBY, Editor

Vol. 11 November 1960 No. 11

Supported by
DEPARTMENT OF THE AIR FORCE
DEPARTMENT OF THE ARMY
DEPARTMENT OF THE NAVY
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
NATIONAL SCIENCE FOUNDATION
UNITED STATES WEATHER BUREAU

Special Feature in This Issue

Annotated Bibliography on Night Airglow
By
Andrew J. Meglis and Ismail Saad

(For table of contents see back cover)

Published monthly at Prince and Lemon Streets, Lancaster, Pa., by the AMERICAN METEOROLOGICAL SOCIETY, 45 Beacon Street, Boston 8, Mass.

Printed and issued by: Lancaster Press, Inc.

FOREWORD

Meteorological and Geoastrophysical Abstracts is a monthly publication devoted to current literature in meteorology, geophysics and astrophysics.

Part I contains abstracts of current literature in the fields of meteorology, etc.

Part II of each issue comprises an annotated bibliography of important references on a special subject. Bibliographies published in the successive issues were:

Vol. I, 1950

1. Atmos. Pollution	2. Aerobiology	3. Cloud Physics	4. Hail
5. Tornadoes	6. Volcanic Dust	7. Climat. Changes	8. Thunderstorms
9. Icing	10. Acoust. Propagation	11. Evaporation	

Vol. II, 1951

1. Extended Forecast.	2. Long Range Forecast.	3. Soil Temp.	4. Constants, etc.
5. Clim. of Near East	6. Clim. of Middle East	7. Special Winds	8. Radar Storm
9. Condensation Trails	10. Clim. of N. E. Africa	11. Mountain Met.	Detect.

Vol. III, 1952

1. Clim. of N. W. Africa	2. Carbon Dioxide	3. Clim. of Argentina, etc.	4. Dew
5. Objective Forecast.	6. Stratus Forecast.	7. Urban Climatology	8. Clim. of C. Africa
9. Visibility	10. Glaze and Rime	11. Free Air Turbulence	

Vol. IV, 1953

1. Turbulence Theory	2. Turbulent Diffusion	3. Frost	4. Clim. of Australia, etc.
5. High Level Winds	6. Winds in Stratosphere	7. Jet Stream	8. Radiation Bioclim.
9. Clim. of Pacific	10. Auroras	11. Sferics	

Vol. V. 1954

1. Oceanog. Met.	2. Clim. of S. E. Asia	3. Auroral Physics	4. Tropopause
5. Balloons	6. Numerical Forecast.	7. Radiation Data	8. Vertical Motion
9. Clim. of Arctic	10. Industrial Met.	11. Wind Waves and Swell	

Vol. VI, 1955

1. Bibliog. of Bibliog.	2. Texts & Monogr. Bibliogs.	3. Storm Surges
4. Ionospheric Prop.	5. Photochem.—Upper Atmos.	6. Cloud Physics
7. Radar Cloud Physics	8–9. Atmos. Nuclei	10. Weather Modification 11. Cooling Power

Vol. VII, 1956

1. Synoptic Met.-Arctic	2. Clim. of Enclosed Spaces	3. Cosmic Rays (–1952)
4. Cosmic Rays (1953–56)	5. Atmos. Radioactivity	6. Inversions
7. Snow Micromet.	8. Snow Micromet. (Suppl.)	9–11. Tropical Cyclones

Vol. VIII, 1957

1. Solar Weather Relations	2. Night Airglow	3. Forecasting Special Elements
4. Forest Micrometeorology	5. Hydromet. Forecasting	6. Numerical Forecast. (Suppl.)
7. Albedo 8. Meteors	9–10. Tropospheric Prop.	11. Medical Meteorology

Vol. IX, 1958

1. Radioastronomy	2. Solar Astrophysics	3. Radioactivity in Atmosphere
4. Waves and Currents	5. Physical Oceanog.	6. Dynamic & Phys. Oceanog.
7. Long Range Forecast.	8. Radar Met. 9. Cosmic Rays	10–11. Geomagnetism

Vol. X, 1959

1. Works of C. E. P. Brooks	2. Tornado Forecasting	3. Soil Moisture	4. Sferics
5–6. Ozone	7. Acoustic Waves	8. Evaporation Measurement	
9. Evapotranspiration (–1955)	10. Evapotranspiration (1956–1959)	11. Evaporation	

Vol. XI, 1960

1. Outstanding Reference Works	2. Outstanding Texts	3. Numerical Forecast. (Suppl.)
4. Ionospheric Physics	5. Ionospheric Propagation	6. Ionosphere
7. Forecast Verification	8. Radar Meteorology	9. Rocket Meteorology
10. Satellite Meteorology	11. Airglow	

Other bibliographies in preparation are:

Aurora	*Limnology*	*Precipitation Chemistry*
High Atmosphere Temperatures	*Physics of Lightning*	*Twilight Phenomena*

Part III contains a listing of reviews, translations, reprints, and the contents of important publications. These are published in the earliest issue where space permits.

Part IV is made up of author, subject and geographical indexes. The December issue comprises cumulative author, subject, geographical and journal indexes.

EXPLANATIONS

Location of material: For each entry, a symbol is given for at least one library where the material may be found. The Union List of Serials (Gregory) is the source of most of the symbols used. In some cases, where no symbol has been assigned to a library, one will be devised according to the principles of the Union List.

Library symbols used frequently may be found in the following list:

DA:	U. S. Dept. of Agriculture Library, Washington, D. C.
DBS:	U. S. Bureau of Standards Library, Washington, D. C.
DGS:	U. S. Geological Survey Library, Washington, D. C.
DLC:	Library of Congress, Washington, D. C.
DN-HO:	U. S. Navy Hydrographic Office Library, Suitland, Md.
DNLM:	U. S. National Library of Medicine, Washington, D. C.
DSI:	Smithsonian Institution, Washington, D. C.
DWB:	U. S. Weather Bureau Library, Washington, D. C.

Other symbols:

*	before an entry indicates a good data source.
†	before an entry indicates a good bibliography.
§	before an entry indicates a synoptic case history study accompanied by charts.
Ⓢ	after an abstract indicates an abstract prepared for NASA.

Geographic locations are in the English form rather than the form used locally, for example, Moscow for Moskva.

Titles of articles or monographs are in the language of the original article unless otherwise stated. Slavic (Cyrillic) titles are transliterated into the Roman alphabet using a modification of the Library of Congress transliteration scheme.

Abbreviations:

Titles of periodicals are not abbreviated, as a rule.

The months of the year from March to July are not abbreviated. Other months are abbreviated as Jan., Feb., Aug., Sept., Oct., Nov., and Dec.

The word or abbreviation for Volume (Tom, Band, Jahrgang, Año, etc.), for Number (Heft, Fascicule, Vypusk, etc.) and for page or pages is omitted from most entries. Thus an entry will read as follows:

Meteorologische Rundschau, 2(5/6):146–151, May/June 1950.

This indicates that the article appeared in *Meteorologische Rundschau*, *Jahrgang* 2 (Vol. 2), *Heft* 5/6 (No. 5/6), *pages* 146–151, May/June 1950.

PART I. ABSTRACTS OF CURRENT METEOROLOGICAL AND GEOASTROPHYSICAL MATERIAL

A. GENERAL

1. COLLECTED WORKS

See also: **Climate, Antarctica, 11.11–21.**

11.11–1 551.579:631.811.91

Advances in Agronomy, Vol. 11, 1959. Prepared under the auspices of the American Society of Agronomy. Ed. by A. G. Norman. Issued N. Y., Academic Press, **1959.** 425 p. figs., tables, refs. Articles of interest, abstracted separately: Russell, M. B.; Hurlbut, L. W. and Angus, D. E., **Water and the hydrologic cycle,** p. 4–35. Russell, M. B., **Interactions of water and soil,** p. 35–42. Wiersma, D., **The soil environment and root development,** p. 43–51. Kramer, P. J. and Russell, M. B., **Plant-water relations,** p. 51–77. Hagan, R. M.; Vaadia, Y.; Russell, M. B. et al., **Soil-plant-water interrelations,** p. 77–118. Meijers, P. G., **Soils and land use in the Netherlands,** p. 333–368. **DWB** (630.72 A244ad)—The present review represents the work of the Committee on Soil-Crop-Water Relationship, appointed in 1957. It opens with a brief review of the physical nature of water. Then follows a discussion of the several components of the agricultural water supply and of the principal factors affecting water use by plants. Consideration of the broad effects of water on soil properties and of the intake and storage of water comes next. This leads to a detailed consideration of soil factors affecting the development of roots. Interactions of the total soil-plant-water system are considered at the end. *Subject Headings:* **1. Soil-plant-water relationships 2. Water supply for plants. I. Norman, A. G.** (*ed.*).—*I.S.*

11.11–2 551.506.22 551.509.313 551.593.653

*†Akademiia Nauk SSSR. Mezhduvedomstvennyĭ Komitet po Provedeniiu MGO, **Nekotorye problemy meteorologii: sbornik stateĭ, II razdel programmy MGG (Meteorologiia), No. 1.** [Some problems of meteorology: articles (in connection with) Section II of the IGY program, Meteorology, No. 1.] Moscow, **1960.** 140 p. figs., tables, refs. Contents: Kibel', I. A. and Sadokov, V. P., **O kratkosrochnom prognoze pogody v neadiavatichskikh sluchaiakh** [Short-term weather forecasting in nonadiabatic cases], p. 7–12. 25 eqs. Buleev, N. I. and Marchuk, G. I., **O chislennom reshenii uravneniĭ dinamiki atmosfery** [Numerical solution of equation of atmospheric dynamics], p. 13–23. 4 refs., 60 eqs. Iudin, M. I., **O razvitii chislennogo kratkosrochnogo prognoza na osnove fiziki** [Progress of numerical short term forecasting on the basis of physics], p. 24–26. eq. Monin, A. S. and Obukhov, A. M., **Osnovnye tipy dvizheniĭ baroklinnoĭ atmosfery v pole sily Koriolisa** [Main types of movement of baroclinical atmosphere in the Coriolis force field], (Abstract only), p. 27. Krichak, O. G., **Osobennosti atmosfernoĭ tsirkuliatsii nad Antarktikoĭ i ee sviaz' s tsirkuliatsieĭ Iuzhnogo polushariia** [Characteristics of atmospheric circulation over Antarctica and its connection with the circulation in the Southern Hemisphere], p. 28–71. 31 figs., 14 refs. Konstantinov, A. R. and Pushkarev, V. F., **Nabliudeniia nad ispareniem s poverkhnosti vody i pochvy na territorii SSSR** [Observations of evaporation from the water surface and the ground on the territory of the U.S.S.R.], p. 72–95. 6 figs., 5 tables, 3 charts, 23 refs. English summary p. 94–95. Pivovarova, Z. I. and Pleshkova, T. T., **Aktinometricheskie nabliudeniia v SSSR po programme Mezhdunarodnogo geofizicheskogo goda** [Actinometric observations in the U.S.S.R. on the program of the International Geophysical Year], p. 96–111. 11 figs., 3 tables, chart. English summary p. 110. Khvostikov, I. A., **O prirode serebristykh oblakov** [On the nature of noctilucent clouds], p. 112–114. fig., 11 refs. Sharonov, V. V., **Nabliudeniia**

chastoty poiavleniia serebristykh oblakov na stantsiiakh SSSR [Observations of the frequency of occurrence of noctilucent clouds at the U.S.S.R. stations], p. 115–116. Grishin, N. I., **Volnovye dvizheniia i meteorologicheskie usloviia poiavleniia serebristykh oblakov** [Wave movements and meteorological conditions of appearance of noctilucent clouds], p. 117–119. 4 figs. (fold.), 3 refs. Bronshten, V. A., **O prirode serebristyky oblakov** [On the nature of noctilucent clouds], p. 120–123. 3 figs., 15 refs. Sharonov, V. V., **Problemy i metody absoliutnoĭ fotometrii serebristykh oblakov** [Problems and methods of absolute photometry of noctilucent clouds], p. 124–140. 2 figs., table, 18 refs., 21 eqs. English summary p. 140. All articles abstracted separately. **DWB** (M(055) N418ne)—The V CSAGI Meeting (Moscow, July–Aug. 1958), along with scientific-organizational questions, included symposia on various geophysical disciplines on the first results of the IGY. There were 3 symposia on meteorology. Eleven papers of Soviet and foreign scientists were presented at the symposium on numerical methods of weather prediction. This issue publishes 4 papers of Soviet scientists. In addition there is a summary of the paper by A. S. Monin and A. M. Obukhov, **Basic types of the movement of baroclinic atmosphere in the field of Coriolis force.** At the symposium on noctilucent clouds, 7 papers were presented, 4 of which are published in this issue. At the symposium on Antarctic meteorology, 3 papers were presented, of which the paper of O. G. Krichak, is published in this issue. In this issue are included some articles on scientific methodology. These articles deal with observations of evaporation from ground and water surface, actinometric observations, methods of absolute photometry of noctilucent clouds, etc. *Subject Headings:* **1. IGY meteorological analyses 2. Numerical forecasting 3. Noctilucent clouds.**—*From Preface.* Ⓢ

11.11–3 551.506.3(98) 551.326.62(98)

*†Bushnell, Vivian (*ed.*), **Scientific studies at Fletcher's Ice Island, T-3, 1952–1955, Vol. 1.** *U. S. Air Force Cambridge Research Center, Geophysical Research Papers*, No. 63, Vol. 1, Sept. **1959.** 219 p. numerous figs. (5 fold.) charts p. 187–219, numerous tables, refs. at end of each ch., general bibliog. p. 169, numerous eqs., 3 appendixes. Contents: Bushnell, Vivian: **Introduction,** p. 1–6. Crary, A. P. and Goldstein, Norman: **Geophysical studies in the Arctic Ocean,** p. 7–30. Worthington, L. V.: **Oceanographic observations,** p. 31–35. Browne, Irene M. and Crary, A. P.: **The movement of ice in the Arctic Ocean.** Ericson, David B. and Wollin, Gosta: **Micropaleontology and lithology of Arctic sediment cores,** p. 51–58. Green, Keith E.: **Ecology of some Arctic foraminifera,** p. 59–81. Mohr, John L.: **Marine biological work,** p. 82–103. Paynter, Raymond A., Jr.: **Birds in the Upper Arctic,** p. 104. Knox, George A.: **Pelagic and benthic Polychaetes of the Central Arctic Basin,** p. 105–114. Barnard, J. Laurens: **Epipelagic and under-ice amphipoda of the Central Arctic Basin,** p. 115–152. Giletti, B. J. and Kulp, J. L.: **Tritium observations,** p. 153–158; Ault, Wayne U.: **Oxygen isotope measurements on Arctic cores,** p. 159–168. Vol. 2, Dec. 1959. 117 p. numerous figs., tables, refs. at end of each ch., 3 appendix. Contents: Banks, H. C. and Partanen, E. N.: **Meteorological observations,** p. 1–5. Fritz, Sigmund: **Solar radiation measurements in the Arctic Ocean,** p. 6–10. Belmont, A. D.: **Upper-air temperatures, 1952–1954,** p. 11–41. All articles abstracted separately. **Vol. 3,** April **1960.** 114 p. numerous figs., tables, refs. at end of each ch., 4 appendix. Contents: Crary, A. P.: **Arctic Ice Island and ice shelf studies,** p. 1–27. Crary, A. P.: **Seismic studies,** p. 38–44. Marshall, Ernest W.: **Structure and stratigraphy of T-3 and the Ellesmere Ice Shelf,** p. 45–57. Stoiber, Richard E.; Lyons, John B.; Elberty, William T. and McCrehan, Richard H.: **Petrographic evidence on the source area and age of T-3,** p. 58–72. Polunin, Nicholas: **Macroscopic plant materials,** p. 73–85. Barghoorn, Elso S.: **Palynological studies of organic sediments and of coated slides;** p. 86–91. Prince, Alton E. and Bakanauskas, Sam: **Airborne viable micro-organism spores collected near sea level,** p. 92–94. All articles abstracted separately. **DWB, DLC**—In Vol. I, scientific studies based on field investigations at Fletcher's Ice Island T-3 during the period 1952 to 1955 are reported with appendixes containing data tables. Included are general bathymetry, sub-bottom seismic studies, gravity studies, oceanographic observations, ice movement studies, micropaleontological and lithological analysis of sediment cores, general Arctic Ocean biology, detailed studies of ice, and oxygen isotope measurements on sediment cores. In addition to the works of Air Force Cambridge Research Center scientists and contractors, the series includes studies prepared by, and for several U. S. Government agencies. In Vol. 2 results of field

investigations are presented and include a summary of surface meteorological observations, a study of upper air temperatures, and an analysis of solar radiation data. Appendixes include tables of surface meteorological observations, mean monthly upper-air temperatures at selected levels, solar radiation data, and plots of position lines with resulting geographical locations. In Vol. 3, the nature and history of the ice of T-3 are discussed. Various approaches have been used, including seismic thickness determinations, ice core studies, and analysis of rock and plant specimens. In addition, the theory of formation of thick ice in the Arctic Ocean is explored. *Subject Headings:* **1. Arctic Ice Island (T-3) 2. Meteorological data, Arctic 3. Solar radiation, Arctic 4. Ice shelf studies 5. Arctic.**

11.11–4 551.511.6:551.551.8:551.510.42(08)

Frenkiel, F. N. (*Applied Physics Lab., Silver Spring, Md.*) and Sheppard, P. A. (*Imperial College, Univ. of London*) (*eds.*), **Atmospheric diffusion and air pollution: proceedings of a Symposium held at Oxford, Aug. 24–29, 1958.** N. Y., Academic Press, **1959.** 471 p. figs., tables, refs., eqs. (**Advances in Geophysics,** ed. by H. E. Landsberg and J. Van Mieghem, Vol. 6.) (For listing of contents, *see* Pt. III, p. 321, Feb. 1960, *Met. Abstracts.*) All articles abstracted separately. **DWB, DLC.** Also: Iudin, M. I., **Mezhdunarodnyĭ simpozium po atmosfernoĭ diffusii zagriazneniiu vozdukha.** [International symposium on atmospheric diffusion and air pollution.] *Meteorologiia i Gidrologiia,* Leningrad, No. 1:67–69, Jan. **1959. DWB, DLC**—The purpose of the International Symposium on Atmospheric Diffusion and Air Pollution was to bring together fluid dynamicists, meteorologists, oceanographers, etc. in order to discuss atmospheric diffusion and the basic aspects of its application to air pollution studies. The papers discussed were arranged as follows: a general survey of atmospheric diffusion and pollution; recent findings on atmospheric turbulence; theory of turbulent diffusion; diffusion of heavy or finite particles; transfer through the troposphere and stratosphere; effects of thermal stratification on diffusion; pollution patterns from point area sources and review of the sessions. In the introduction the editors, F. N. Frenkiel and P. A. Sheppard describe the origin and organization of this Symposium. A brief survey of the field of turbulence based on the papers presented at the symposium is given by Sir Graham Sutton. In the paper **Editor's review,** Frenkiel and Sheppard discuss the present status and future possibilities of research in atmospheric diffusion and evaluate the significance of the findings presented in the various papers. *Subject Headings:* **1. Atmospheric diffusion and air pollution symposia. I. International Union of Theoretical and Applied Mechanics. II. Landsberg, H. E.** (*ed.*) **III. Van Mieghem, J.** (*ed.*)—*I.L.D.*

11.11–5 551.573:061.3 551.574.1:061.3

*†International Congress of Surface Activity, **Proceedings of the Second Congress.** Ed. by J. H. Schulman. N. Y., Academic Press; London, Butterworths, **1957.** 4 vol. figs., table, refs. at end of each ch., eqs. Price: $50.00 per set. Contents: Vol. I, **Gas/liquid and liquid/liquid interface.** 521 p. Vol. II, **Solid/gas interface.** 348 p. Vol. III, **Electrical phenomena and solid/liquid interface.** 621 p. Vol. IV, **Solid/liquid interface (washings, etc.) and cell/water interface.** 352 p. **DLC** (QD506.I56). Review by Eric Hutchinson in *Science,* 128(3324):588–589, Sept. 12, **1958.**—The 197 articles in these 4 volumes presented at the Second World Congress on Surface Activity are: Vol. I, (Gas/Liquid and Liquid/Liquid interface) Ch. 1. Insoluble films, 2. Soluble films, 3. Foams, 4. Evaporation retardation, 5. Monolayers liquid/liquid interface, 6. Solubilization, 7. Emulsions, 8. General phenomena; Vol. II, (Solid/gas interface) Ch. 9. Physical adsorption, 10. Chemisorption; Vol. III, (Electrical Phenomena and Solid/Liquid interface) Ch. 11. Electrical phenomena. Vol. IV, (Solid/Liquid interface) Ch. 12. Contact angles, spreading and wetting, 13. Flotation, 14. Adhesion, 15. Adsorption, 16. Lubrication, 17. Nucleation, 18. Washing, 19. Suspensions and agglomerations, 20. Cell water/interface (Biological). The material of special interest to meteorologists is found in the section of Vol. I on Evaporation retardation (p. 259–280): **The Retardation of evaporation by monolayers** by V. K. LaMer; **Fatty alcohols for water conservation,** by I. K. H. McArthur (*Bromborough Pool*) and K. Durham (*Port Sunlight*) and **Reduction of evaporation from reservoirs** by F. Grundy (*Nairobi, Kenya*), and a **Discussion on suppression of evaporation from snow-fields** by K. Groth, and other subjects. Two other articles are of interest (in section on **Monolayers,** p. 281–294): **1. Rates of adsorption at an oil/water**

interface—a technique for times greater than 0.1 second by J. T. Davies, J. A. Collis Smith and D. G. Humphreys (*Cambridge Univ.*); and the **Coalescence of aqueous droplets with an oil/water interface,** by G. A. H. Elton and R. G. Picknett (*London*). All 36 articles in Vol. II on **Solid/gas interface (physical and chemical adsorption and sorption)** have theoretical and practical value for those interested in nucleation, cloud physics, evaporation of snow and ice, etc. *Subject Headings:* **1. Conference on surface activity 2. Evaporation control 3. Adsorption 4. Chemisorption.**—*M.R.*

2. TEXTBOOKS AND MONOGRAPHS

See also: **Climat. classification, Gabon** (Malik), **11.11–268.**

11.11–6 551.515.2(02)(729)(75)

*†Dunn, Gordon E. (*Chief Meteorologist, U. S. W. B., Miami; Director, Natl. Hurricane Center, Miami*) and Miller, Banner I. (*Natl. Hurricane Center*), **Atlantic hurricane.** Baton Rouge, Louisiana State Univ. Press, **1960.** 326 p. 87 figs., 31 tables, 116 refs. Glossary of meteorological terms p. 308–312. Price: $10.00. **DLC, DWB.** Review by H. Wexler in *Science*, 132(3438):1392, Nov. 18, **1960.**—For almost 20 years, TANNEHILL's book on **Hurricanes** (*see* 11B–42, Feb. 1960, *Met. Abstracts*) was the standard treatise on West Indian hurricanes, going through 9 editions between 1938 and 1956. The enormous strides in hurricane reconnaissance by elaborately equipped airplanes and tracking by radar, not to mention the millions of dollars spent in research, analysis, observation, warnings, etc. during the past 4 years or so are bound to produce results which should be brought into the formal literature. With the death of I. R. TANNEHILL in 1959, the lot of bringing this material to students and the public in a systematic form fell to GORDON DUNN, the leading hurricane expert of the U. S. Weather Bureau for the past decade or more. This long-awaited book gives the latest (up to late 1958) information and data resulting from the research at the National Hurricane Center at Miami, and at other centers in the U. S. and Caribbean, and data from the ocean areas, all in systematic and readable style with graphs, charts, tables, maps, photos, schematic diagrams, etc. The book opens with dramatic eye-witness accounts (by trained observers) of recent disastrous hurricanes, background information as to terms, girls' names, etc. This is followed by a chapter on tropical weather and circulation; one on hurricane climatology (classification, source regions, frequency, seasonal variation, long period variations); hurricane characteristics (wind, pressure, dimensions, duration, vertical structure and the eye); hurricane swells and surges, tornadoes, lightning and rains; energy sources, budget and modification; formation, warning system of U. S. W. B.; locating and tracking by ship, aircraft, radar and satellite (Tiros I, April 1960: photo of typhoon, brief description included); forecasting techniques (climatology, continuity, steering, numerical forecasting, Riehl-Haggard system, etc.); intensification and dissipation; destructive forces, preparation for the hurricane (building construction, precautions, etc.); regional hazards and, finally, research on tracking and control, etc. An appendix gives a tabulation of all tropical cyclones in the U. S. and Texas from 1635–1958, arranged by regions, with damage and intensity data, and a glossary of meteorological terms used in the book, plus an excellent list of references to recent literature, an author and a detailed subject index. A great deal of credit is due to MILLER for many contributions to this invaluable book on a subject that is of universal interest even to those who have never experienced the destruction forces of the tropical cyclone. *Subject Headings:* **1. Hurricane textbooks 2. Atlantic hurricanes.**—*M.R.*

11.11–7 551.511(02)

*†Kopcewicz, Teodor, **Fizyka atmosfery, Część III, Kinematyka i dynamika.** [Physics of the atmosphere, Vol. 3, Kinematics and dynamics.] Warsaw, Pánstwowe Wydawnictwo Naukowe, **1959.** 403 p. numerous figs., tables and eqs., foot-refs. **DLC** (QC880.K66)—This volume presents in 11 chapters the basic theory of wind temperature and wind fields, turbulence energy transport, general circulation, etc. as derived from classical hydrodynamics (Bergen, Leipzig, British and U. S.), but with a few references to material as recent as 1958, and with many illustrative Northern Hemisphere charts from U. S. sources of the 1946–1951

period, especially from the **Compendium of Meteorology.** Extensive mathematical derivations are presented along with simple schematic diagrams and illustrative tables. *Subject Heading:* **1. Dynamic meteorology textbooks.**—*M.R.*

11.11–8 551.574.1(02)

†Podzimek, Josef, **Fysika oblaků a srážek.** [Physics of clouds and precipitation.] Prague, Nakl. Československé Akademie Věd, **1959.** 476 p. 182 figs., 61 photos, tables, 755 refs., eqs. **DLC** (QC921.P72)—This is probably the most detailed textbook treatment of cloud physics, including the results of the latest research, theory and observation and application of knowledge of nuclei (through 1956). The reference list of over 750 works in the field is quite complete, both historically and for the period through 1956 covered by the work. The 9 chapters deal with: 1) water in the atmosphere, 2) clouds and vapor, 3) condensation nuclei, 4) water clouds, 5) ice nuclei, 6) ice clouds, 7) cloud formation, 8) cloud development, 9) nuclei in the atmosphere. Results of research are illustrated by sources of curves, photographs, diagrams and the equipment used in laboratory and field by photos and schematic diagrams. Nomograms, critical tables, cloud photos, tables giving results of seeding experiments, etc. and an author and subject index are appended. *Subject Headings:* **1. Cloud physics textbooks 2. Condensation nuclei 3. Czech language.**—*M.R.*

11.11–9 551.510.7(02)

§*†Styra, B. I., **Branduolines meteorologijos klausimai.** [Problems of nuclear meteorology.] Ed. by C. Garbaliauskas. *Lietuvos TSR Mokslų Akademija. Geologijos ir Geografijos Institutas, Monografinė Serija*, No. 1, **1959.** 417 p. 711 figs., 128 tables, 543 refs. (110 in Russian), numerous eqs. t-p, foreword (p. 9) and contents in Russian, Lithuanian and English.—A most thorough theoretical and practical text on origin, kinds of atmospheric radioactivity, sampling and measurement methods, results of measurements, spatial and temporal variations in isotopes and in total exchange between earth and atmosphere removal, radioactivity in precip., small scale and planetary movements, influence of cloudiness, sunshine, rainfall, cosmic rays, etc. The text is well illustrated with histograms, graphs, schematic diagrams, tables, curves, synoptic and trajectory charts, etc. The exceedingly thorough bibliography covers the world's literature on atmospheric radioactivity from 1902 to 1958, and the text provides a comprehensive survey of the literature in a systematic manner. Problems concerning the effect of radioactivity on ionization of the air or on atmospheric electricity are deliberately omitted. *Subject Headings:* **1. Nuclear meteorology textbooks 2. Atmospheric radioactivity.**—*M.R.*

11.11–10 551.46(267)

*†Muromtsev, Alekseĭ Mikhaĭlovich, **Osnovnye cherty gidrologii Indiĭskogo okeana.** [Basic outline of hydrology of the Indian Ocean.] Leningrad, Gidrometeoizdat., **1959.** 437 p. 66 figs., 14 tables, 112 refs. Appendix (tables), p. 178–437. Also Supplement No. 2, **Atlas vertikal'nykh razrezov i kart temperatury, solenosti, plotnosti i soderzhaniia kisloroda.** [Vertical profile atlas and charts of temperature, salinity, density, and percentage of oxygen.] 160 charts. **DWB** (551.45 M977osi)—A large monograph similar to the one by the author on the **Hydrology of the Pacific Ocean,** (*see* 10.7–29 and 11A–72) containing detailed tabular data from all known expeditions between 1772 and 1957 in the Indian Ocean, especially the data on temperature, salinity, density and oxygen content with depth. The circulation scheme of the Indian Ocean water masses is also treated. The first chapter describes scientific voyages in the Indian Ocean from the earliest days. Ch. 2 describes in detail the observational material and shows on charts the frequency of observation in each 10° square from 30°N to 70°S and 20°E to 150°E. A catalog of expeditions shows date, depth of soundings, month or months of observations and type of data obtained. Expeditions are listed by squares of latitude and longitude and chronologically. Ch. 3 discusses in detail temperature and heat balance, and presents vertical cross sections to 5000 m. depth. Ch. 4 discusses salinity, Ch. 5, density, Ch. 6, oxygen content, Ch. 7, classification of water masses and Ch. 8 a general circulation scheme for various depths. Appendix I (p. 178–437) gives the data *in extenso.* Appendix II (Supplement), the atlas of vertical cross-sections and charts of temperature, salinity, density and O_2 content is separate. *Subject Headings:* **1. Oceanography of Indian Ocean 2. Oceanographic data, Indian Ocean 3. Indian Ocean.**—*M.R.*

11.11–11 551.582.1(479.25) 551.589(479.25)

*§†Bagdasarian, Andranik Bakhshievich, **Klimat Armianskoĭ SSR.** [Climate of Armenia.] Erevan, Akademiia Nauk Armianskoĭ SSR, **1958.** 139 p. 40 figs., 26+18 tables, 63 refs. At head of t-p.: Akademiia Nauk Armianskoĭ SSR. Institut Ekonomiki. Added t-p. in Armenian. **DLC** (QC989.R5A7). Review by L. A. Enfiadzhian in *Meteorologia i Gidrologia*, Moscow, No. 7:49–51, July **1960.**—A well rounded analysis of the climate of the Armenian SSR, with emphasis on the regional factors, but not neglecting the role of the general circulation, synoptic climatology, seasonal factors and the effect of orography and altitude. The last 6 chapters (of 15) take up successively the particular climates of the 6 natural regions of the area. A good bibliography and 9 pages of data tables presenting monthly frequencies of weather types for 18 locations in Armenia. *Subject Headings:* **1. Climate of Armenian S.S.R. 2. Armenian S.S.R.**—*M.R.*

11.11–12 551.582.1(573) 551.585(573)

*Stotsenko, A. V., **Klimaticheskiĭ ocherk Prikhankaĭskoĭ ravniny i prilegaiushchikh k neĭ territoriĭ.** [Climatic outline of the Khanka Valley region and neighboring areas.] (In: Akademiia Nauk SSSR. Dal'nevostochnyi Filial, Vladivostok. Institut Geografii, **Materialy po fizicheskoĭ geografii iuga Dal'nego Vostoka.** Moscow, Akademiia Nauk SSSR, **1958.** p. 131–161. 16 figs., 7 tables, 22 refs.) **DWB** (551.4 A313ma)—The general climatic features of the area lying between Vladivostok in the south and Khabarovsk in the north and between the Sea of Japan and Manchuria are described in terms of prevailing air masses, special note being made of the predominance of advective processes over radiational ones. Then, after a useful history of the station network in this area, the individual aspects of the climate (the wind and temperature regimes, the distribution of moisture and precipitation, etc.) are taken up. The author concludes with a conventional classification of the climates of subdivisions of this area, mainly according to temperature, precipitation, and moisture. Included with the discussions of the individual aspects of the climate are January and July and/or annual isoline maps of the following: mean temperature, wind speed (with wind direction roses at 18 stations), date when 0°C is reached in spring and fall, duration of frostless period, negative and positive temperature sums, depth of frost penetration in the ground, mean snowdepth and number of days with snowcover, mean evaporation and relative and absolute humidity, mean precipitation amount (in cold and warm periods of year), percentage of days with cloud cover, 8 to 10/10, and number of days with fog, thunderstorms, and snowstorms. Aside from illustrative temperature data along a north-south and an east-west line across the area, and comparative temperature and precipitation data for Vladivostok for different periods of record, no tabular data are given for individual stations, nor are exact periods of record given for the stations whose data were used in compiling the charts. *Subject Headings:* **1. Climate of Khanka Valley 2. Climatic classifications 3. Khanka Valley, Maritime Territory, U.S.S.R.**—*R. S. Quiroz.*

11.11–13 538.56:551.511

†Tatarskiĭ, Valerian Il'ich, **Teoriia fluktuatsionnykh iavleniĭ pri rasprostranenii voln v turbulentnoĭ atmosfere.** [Theory of fluctuation phenomena associated with the propagation of waves in a turbulent atmosphere.] Moscow, Akademiia Nauk SSSR, **1959.** 230 p. 45 figs., 99 refs., numerous eqs. **DLC** (QC931.T3)—A unique and useful textbook or monograph presenting the basic theory of statistical turbulence and its application to the solution of problems concerning propagation of radio, light and sound waves in a turbulent atmosphere. Methods of observing or recording turbulent fluctuations of temp., wind, and of computing the data, the nature or microstructure of turbulent flow, the scattering of electromagnetic waves in a turbulent atmosphere and of sound waves in local isotropic turbulence, solution of amplitude and phase fluctuation problems for monochromatic waves on the basis of geometric optics and on the basis of wave equation and of spherical waves and, finally, experimental data for the lower troposphere for radio and light waves and scintillation data for stars and telescopes. *Subject Headings:* **1. Turbulence theory applications to wave propagation 2. Electromagnetic wave propagation theories 3. Scintillation of stars 4. Tropospheric propagation theories 5. Acoustical propagation theories.**—*M.R.*

3. POPULAR BOOKS, MANUALS AND ATLASES

See also: **Oceanog. data, Indian Ocean** (Muromtsev), **11.11–10.**

11.11–14 551.5(99)(09)

Debenham, Frank, **Antarctica: the story of a continent.** London, Herbert Jenkins, **1959.** 264 p. photos. **DLC** (G870 1959.D4)—This book, divided into 9 chapters, gives an interesting account of Antarctica from early to modern times. In popular style the author describes the constitution of the continent, the nature of the surrounding ocean and the history of the discovery of Antarctica. Of chief interest are the descriptions of how man has developed the techniques of dealing with the hostile climate, the significance of Antarctic research for mankind, its political future, and last but not least, the psychological reactions of explorers under the stresses of climate and isolation. The book is nicely illustrated by photographs. *Subject Headings:* **1. History of Antarctica 2. Antarctic research 3. Antarctica.**—*I.S.*

11.11–15 551.465(02)(98)

†Chaplygin, Evgeniĭ Il'ich, **Rukovodstvo po nabliudeniiam nad techeniiami na poliarnykh stantsiiakh i observatoriiakh.** [Handbook for observations of ocean current at polar stations and observatories.] Ed. by I. V. Maksimov. Leningrad, Morskoĭ Transport, **1957.** 291 p. 95 figs., 115 tables, bibliog. p. 211–212, eqs. At head of t-p.: Arkticheskiĭ Nauchno-Issledovatel'skiĭ Institut Glavnogo Upravleniia Severnogo Morskogo Puti Ministerstva Morskogo Flota SSSR. **DLC** (GS241.C48)—A substantial and practical manual for hydrologists for setting up programs, taking observations, maintaining equipment, recording and working up observations at polar stations or observatories along the Arctic seas and Northern Sea Route. Forecasting ice conditions are especially important for navigation in these regions, so considerable emphasis is placed on measuring ice and ice movements. Instruments and equipment are described in detail and illustrated. Forms for recording and tables for computation and instruction are provided, and many examples are cited. *Subject Headings:* **1. Ocean current observation manuals 2. Arctic ice movement forecasting 3. Arctic.**—*M.R.*

11.11–16 523.79:523.49

*Bollinger, Clyde J., **Atlas (1900–1959) of planetary solar climate with sun-tide indices of solar radiation and global insolation.** 1st ed. Norman, Okla., Battenburg Press, **1960.** 121 p. (2 p. pref. and introd.) Almost entirely tables and charts. Price: $6.00. **DWB** (M83.13 B692at). Also his **Atlas . . . 1960.** 1 sheet fold. (in Weather Bureau copy inserted in pocket of preceding title). Price: $1.00.—This Atlas consists primarily of data. It contains solar and global indices for the 60 yrs from 1900 to 1959. The Jupiter, Venus, Earth constituent tide force is also shown. Additional tables give astronomical constants, mean Hemisynodic period in years (tropical) and relative tide force of planets at mean distance. Monthly global indices for 1960 and 1960 indices on approximate phase dates and mean amplitudes of index cycles are given in tables. A quotation on heat balance made by Voeĭkov in 1884 is included. *Subject Headings:* **1. Planetary-solar relationships 2. Atlases.**—*E.Z.S.* ®

11.11–17 551.582.3(81)

*Brazil. Conselho Nacional de Geografia (and) Brazil. Serviço de Meteorologia, **Atlas climatologico do Brazil, Vol. 3, Indices Climaticos.** Rio de Janeiro, **1960.** 37×36 cm. In 2 Pts. Pt. 1, 67 p. of text and figs., plus charts 1–171. Pt. 2, Charts 172–350. (For abstract on Vol. 1, *see* 7.7–9, July 1956; Vol. 2, *see* 8.9–14, Sept. 1957, *Met. Abs.*) **DWB**—This third volume of the **Climatic Atlas of Brazil** contains data derived from the previous volumes which are applicable to the solution of various technical problems. The introductory text explains the indices of aridity of de Martonne, Knoche; Blair's aridity scale and the climatic classifications of De Fina and Thornthwaite. It deals with cooling effects of winds; saturation deficit; effects on vegetation; equivalent and sensible temperatures; index of continentality and oceanity; various aspects of temperature and humidity and their correlation; interdiurnal variability; frequency of radiation and its various relationships and, finally, with Köppen's classification. The main section consists of charts arranged like those of Volume 1, with similar scale representing the classifications of de Martonne, Knoche, Thornthwaite,

De Fina, Lang, Blair, Meyer and Köppen; oceanic, continental, and deterioration indices humidity; isanomalous lines of temperature and their relation to humidity; cloudiness, aridity radiation, soil moisture and their variations; precipitation, atmospheric pressure and thei amplitudes and variations. *Subject Headings:* **1. Climatic atlases 2. Climate of Brazi 3. Brazil. I. Serra, Adalberto.**—*O.T.*

11.11–18 551.582.3(439.1

Hungary. Országos Meteorológiai Intézet, **Magyország eghajlati atlasza.** [Climati atlas of Hungary.] Budapest, Akadémiai Kiadó, **1960.** looseleaf. 78 p. of maps (in color) Laid in, 20 p. of text (explanations of maps). t-p. in Hungarian and German.—An elegan atlas following the pattern used in the climatic atlas of Czechoslovakia (*see* 10.7–45, *Met. Abs.* giving about 100 colored isarithm charts of the important climatic and phenological parameter in Hungary. The atlas is issued in celebration of the 90th year of the Hungarian Centra Met. Inst. though data for 1901–1950 are used as a rule. Most of the charts are full size wit many colors or shades to indicate different class intervals. Four general charts show: 1) relief 2) natural regions, 3) soil types and 4) vegetation types. The remaining charts are divide among the following major headings: I. Thermal components of the climate (sunshine, clou cover, fog, mean, extreme, first and last temp. of various class limits, growing season, etc.) II. Hygric components (humidity, vapor pressure, precip., snow and snow cover, evapo transpiration); III. Circulation elements (wind roses, characteristic synoptic situations-cyclon and anticyclonic); IV. Extremes of climate (cold and warm Jan., April, July and Oct. durin 1905–1952), extreme precip. months (1915–1952); V. Phenological charts for 12 indicators Some of the charts are for the entire year, some for Jan. and July, some for Jan., April, Jul and Oct. and some are monthly. Each chart or set of charts is fully annotated in the inserte introduction. *Subject Headings:* **1. Climatic atlas of Hungary 2. Phenological atlas of Hun gary 3. Hungary.**—*M.R.*

4. NEW SERIALS

11.11–19 551.584(05

Acta Climatologica, Szeged, Vol. 1, No. 1/4, 1959. Ed. by R. Wagner. Periodicity no stated. Issued by Szeged. Tudományegyetem [University] in its series *Acta Universitati Szegedinensis, Pars Climatologica Scientiarum Naturalium.* Vol. 1, No. 1/4 has 90 p. Article in German or English. (For listing of contents, *see* Pt. III, p. 785, May 1960, *Met. Abstracts* These articles abstracted separately.) **DWB?**—This publication consists of detailed reports o experimental and observational activities in microclimatology. This issue contains studie made in rice fields, in the vicinity of the Donau River, temperature studies in and around sand dune, and microclimate in the vicinity of three workshops (factories). These reports written in German, are well supported with data and illustrative material. A study of th effect of deep and surface manuring on the temperature and water content of sandy soils i presented in English. *Subject Headings:* **1. Serial publications 2. Microclimatology period icals. I. Wagner, R.** (*ed.*) **II. Szeged, Hungary, Tudományegyetem.**—*E.Z.S.*

5. IGY—ARCTIC—ANTARCTICA

See also: **Sec. D5,** p. 1781; **IGY met. analyses,** 11.11 2; **Hist. of Antarctica** (Debenham), 11.11–14; **Ice accumulation-temp. relationships, Greenland** (Loewe), 11.11-191; **Use of snow and ice in Arctic** (Kingery), 11.11–244; **Nutrition and energy expenditure on a polar expedition** (Masterson et al.), 11.11–265.

11.11–20 551.5:550.3(99

Fuchs, Vivian, **Research in the Antarctic during 1960.** *Nature,* London, 184(4690):851 852, Sept. 19, **1959. DWB**—A note on the British and American programs of research in th Antarctic during 1960. The British Antarctic research activities are being carried out by number of permanent scientific stations within the Falkland Islands dependencies sector of th

Antarctic. The daily upper air soundings, the surface meteorological work, the study of radiation balance and ozone observations will continue at the Argentine Islands and Halley Bay as well as the ionospheric work at Port Lockroy. During the summer, at other bases extending from South Georgia, work will be carried out from the ships operating in the area. Geological, topographic and glaciological programs are also described. The American program puts extra emphasis on geology, cartography and biology. The new projects include a scientific expedition to the Bellinghausen Sea. The IGY pattern of over-snow traverse operations will be continued. *Subject Headings:* **1. Antarctic research 2. Antarctica.**—*I.S.*

11.11–21 551.506.5(99) 551.582.1(99)

*§†Sovetskaia Antarkticheskaia Ekspeditsiia, 1955–, **Klimat Antarktiki.** [Climate of the Antarctic.] Ed. by Vasilii Fedotovich Burkhanov et al. Moscow, Gos. Izd-vo Geogr. Lit-ry, **1959.** 285 p. figs., photos, tables, bibliogs. (Its Trudy Kompleksoĭ Antarkticheskoĭ Ekspeditsii Akademii Nauk SSSR: Meteorologiia i Klimatologiia.) Added t-p. in English: Proceedings of Complex Antarctic Expedition of Academy of Science of USSR: Meteorology and Climatology, Climate of Antarctic. (For listing of contents, *see* Pt. III, p. 626, April 1960, *Met. Abstracts.* All articles abstracted separately.) **DWB** (M82.1/99 M886kL), **DLC**—This small volume contains 18 articles (mostly analytical) on various phases of climatology, synoptic meteorology or oceanography of the Antarctic as gleaned from the experiences and data obtained in the first Antarctic IGY expedition, 1955–57, to Mirny, Sovetskaia and Pioneerskaia. Authors of especial renown are: G. M. Tauber, A. Gusev, V. Rastorguev, Kh. P. Pogosian, O. G. Krichak, S. P. Khromov and others, writing on the anomalies of atmospheric circulation over the Antarctic, zonal circulation over eastern Antarctica, local meteorological conditions in eastern Antarctica, Southern Hemisphere, upper air maps, temperature conditions in interior and in upper atmosphere over eastern Antarctica, synoptic case histories of storms, etc. A great deal of data and many synoptic weather charts and other types of charts, soundings, photographs, etc., are included. *Subject Headings:* **1. Climate of Antarctica 2. Antarctica. I. Burkhanov, Vasilii Fedotovich** (*ed.*).—*M.R.*

11.11–22 551.524.36(99)

Zikeev, Nina (*Stepanova*), **The lowest temperature in Antarctica.** *Monthly Weather Review*, Wash., D. C., 87(4):145–146, April **1959.** table, 3 refs. Also: Wexler, Harry, **Note on lowest Antarctic temperature estimated by Shliakhov.** *Monthly Weather Review*, Wash., D. C., 87(4):147, April **1958.** 3 refs. **DWB, DLC**—During the IGY period 1957–58, several extremely low temperatures occurred which broke the previous world record of −67.7°C (Oimyakon, in eastern Siberia, Feb. 6, 1933). The new world record is −87.4°C, recorded at Vostok, on Aug. 25, 1958. This value is lower than a theoretical minimum value computed by Shliakhov, who assumed that the lowest possible temperature occurs in association with a zero radiation balance. Wexler points out that, the back radiation from the atmosphere and the upcoming radiation from the surface being equal, the temperature may still continue to fall, owing to the condition that the snow surface acts as a black body for infrared radiation from the atmosphere, but not all the upcoming radiation is absorbed by the atmosphere, which is not a black body. According to McCormick, the theoretical minimum temperature could be as low as −200°C. *Subject Headings:* **1. Record low temperatures 2. Vostok, Antarctica.**—*R. S. Quiroz.*

6. CONFERENCES—SYMPOSIA

See: **Atmos. diffusion and air pollution symposium** (Frenkiel), 11.11–4; **Conf. on surface activity,** 11.11–5; **Symposia on biol. action of UV radiation** (Dantsig), 11.11–174.

7. EDUCATION—HISTORY—BIOGRAPHY—BIBLIOGRAPHY

See: **Hist. of Antarctica** (Debenham), 11.1–14; **von Humboldt's isotherms** (Model), 11.11–181; **Bibliog. on human bioclimat.,** 11.11–267.

B. APPLICATIONS

1. AERONAUTICS

See: **Rainfall effects on jet aircraft, 11.11–241.**

2. AGRICULTURE

See: **Water supply for plants, 11.11–1; Frost damage to orchards** (Dinkelacker, Aichele), **11.11–184; Frost damage to orchards** (Brooks, Schultz), **11.11–185; Frost damage to orchards** (Primault), **11.11–186; Agronomical study of climates, Gabon** (Malick), **11.11–268; Water requirements for spraying** (Cavanillas), **11.11–269.**

3. FORESTRY

See: **Forest shelter belt effects** (Vorontsov), **11.11–209; Forest shelter belt effects** (Iudin), **11.11–211.**

4. MEDICINE AND HEALTH

See: **Insensible weight loss** (Hale et al.), **11.11–199; Met influences on insomnia** (Svorad, Wellnerová), **11.11–261; Met. influences on emotional reactions** (Wellnerová, Svorad), **11.11–262; Human bioclimat.** (Liman), **11.11–263; Heat effects on man** (Ledwina), **11.11–264; Human bioclimat.** (Masterson et al.), **11.11–265; Climatic stress-nutrition relationships** (Morrison), **11.11–266; Human bioclimat., 11.11–267.**

5. INDUSTRY

See: **Flow, temp., radiation and ice in fisheries research** (Needham, Jones), **11.11–172; Potato storage** (Ash), **11.11–221; Ice on highways** (Wehner), **11.11–228.**

C. ASTRONOMY AND ASTROPHYSICS

1. GENERAL ASTROPHYSICS

See also: **Applications of astronautics in astrophysics** (Schatzman), **11.11–89.**

11.11–23 523.12 550.9:539.16:546.26

Couderc, Paul, **L'âge de la Terre.** [The age of the earth.] *L'Astronomie*, Paris, 74(1) 11–16, Jan. **1960. DLC, NNC, DWB** —After a few considerations concerning the interest that the exact knowledge of the earth's age presents, the author briefly recalls the history of this question and states the principal notions on radioactivity which make it possible to understand the studies relating to the determination of the age of rocks. Research made on rocks from various parts of the world prove that a man can hold in his hand rocks solidified 3 million years ago. The lead isotope method has provided a precise value of the age of the earth's crust which is about 4.5 million years (to ±0.3). This figure is near the age of the earth. The end of the article concerns the age of the meteorites and of the solar system, the age of the galaxy and of the Universe. The age of the Sun, calculated from its present chemical composition, mass, radius and debit is about 5.2 million years. The age of the galaxy should be 12 million years and that of the Universe 13 million years. *Subject Headings:* **1. Cosmogony 2. Age of the Earth 3. Radiocarbon dating 4. Age of the Sun.**—*A. V.* ©

11.11–24 523.1

Bader, Michel (*Ames Res. Ctr., Moffett Field, Calif.*), **On the problem of obtaining thermal proton background and solar wind measurements in space.** *Rand Corporation, Santa Monica* [*Publication*], R-339, **1959.** Paper No. 20 (29 p.). 6 figs., (incl. photo), 13 refs., 21 eqs **DWB** (M10.5 R186ae)—The present state of knowledge of the composition and energy dis-

tribution of matter in the interplanetary space of the solar system has depended to a large extent on interpretation of indirect evidence, and on the construction of plausible theoretical models whose predictions or explanations of phenomena are in general agreement with observations. By means of such techniques it has been deduced that the interplanetary gas probably consists of a thermal background of protons and electrons, with a small percentage of neutral hydrogen atoms, and at most very small traces of other substances. It is further indicated that relatively high velocity streams of protons, known as solar winds, exist which are generally associated with solar activity. With the advent of space flight, it now seems feasible to perform experiments designed to yield direct information on interplanetary gases. Instruments suited for this purpose are discussed, and a particularly simple one evolves if advantage is taken of the fact that the interplanetary charged particles are most likely protons and electrons. Analysis shows that this instrument can be built for density and energy measurements, taking into account the expected ranges of these quantities. It consists of a variable voltage electrostatic analyzer with an electrometer detecting circuit. Such an instrument has been built and calibrated, and the weight, about 2 pounds, and power requirements, 60 milliwatts, appear practical for space vehicle applications. *Subject Headings:* **1. Interplanetary gas measurement techniques 2. Electrostatic analyzers 3. Solar wind measurements.**—*Author's abstract.* Ⓢ

11.11–25 523.821:535.23:535.24

Golay, M., **Photométrie en trois couleurs du corps noir. Effets de la largeur de la bande passante des filtres sur l'excès de couleur.** [Three-color photometry of the black body. Effects of the filter pass band width on the excess of color.] *Archives des Sciences*, Geneva, 12(3):375–392, **1959.** 6 figs., 9 tables, 9 refs. **DLC**—Study of the magnitudes, color indexes, effective wave lengths, color excesses, ratios *Eu/Ey* and *Ev/Ey* for stars radiating like black bodies at various temperatures and of which the radiation crosses various thicknesses of interstellar matter. The photometric system is close to the U, B, V system but not identical. The author investigates the effect of the width of the pass band for the filters used and states a condition which must be fulfilled in order that the ratios *Eu/Ey* and *Ev/Ey* vary as little as possible with the temperature of the stars and the quantity of intervening interstellar matter. *Subject Headings:* **1. Stellar magnitude and radiation 2. Color photometry 3. Black body radiation.**—*A. V.* Ⓢ

11.11–26 523.854 523.87

†Unsöld, A., **Spektroskopische Probleme der Sternentwicklung.** [Spectroscopic problems of star evolution.] *Naturwissenschaften*, Berlin, 47(4):73–81, Feb. 29, **1960.** 4 figs., 2 tables, 22 refs. **DLC**—The recent discussion of A. R. SANDAGE and new investigations about distant galaxies (Milky Way), permit to determine the age of the universe $T_0 = I/H = 10.10^9$ years. Nuclear and astrophysical research makes it possible to construct a model of the universe starting with pure H, transformed in the heat center of stars, into heavy elements. The formation of stable elements D, Li, Be, B, is not explained. The investigations of nuclear processes inside the stars also makes it possible to determine $T_0 = \pm 12.10^9$ years. Spectroscopic methods are very important for investigation of star evolution. So we can analyze the atmosphere of stars, by a spectrum with great dispersion and fine details. The spectral classification must be more detailed, so that it will be useful by problems of the formation of chemical elements. *Subject Headings:* **1. Age of the universe 2. Formation of heavy elements 3. Stellar evolution 4. Star population 5. Spectroscopic problems of star evolution.**—*A. V.* Ⓢ

2. SOLAR PHYSICS

See also: **Planetary-solar relationships** (Bollinger), 11.11–16.

11.11–27 523.75

Athay, R. Grant (*Univ. Colorado*) and Thomas, R. N. (*Natl. Bur. of Standards*), **The chromosphere near active regions.** *Astrophysical Journal*, Chicago, 125(3):788–803, May **1957.** 6 figs., 8 tables, 15 refs., 20 eqs. **DWB, DLC**—Eclipse data show abnormal chromospheric and coronal emission above active sunspot regions. In this paper we analyze data

for such regions on 1952, 1936, and 1932 eclipse spectrograms and attempt to show how the chromospheric structure differs from normal chromospheric regions. If we assume that the chromosphere has two components of different temperature and density at a given height we find that the principal difference between the active regions and the normal regions is a larger proportion of the hotter component in the active region. We also find that the temperatures in the two components are relatively unchanged over the active regions, which is consistent with the assumption of thermal stability for the chromospheric radiation field (ATHAY and THOMAS 1956). *Subject Heading:* **1. Chromospheric temperature.**—*Authors' abstract.*

11.11–28 523.752

†Athay, R. Grant (*Univ. Colorado*) and Thomas, R. N. (*Natl. Bur. of Standards*), **Lyman-α and the structure of the solar chromosphere.** *Astrophysical Journal*, Chicago, 124(3):586–596, Nov. **1956.** 3 tables, 29 refs., 18 eqs. **DWB, DLC**—We investigate the range of chromospheric models compatible with present rocket observations of Lyman-α and conclude that it is considerable. We would require detailed observations of the line profile, with resolution better than one Doppler half-width, to be more specific on the actual model. We find a considerable difference between T_e and a radiation temperature defined by the line intensity, in conformity with earlier discussions of the nonequilibrium chromosphere by ourselves and by GIOVANELLI. A discussion of the relation of these results to the limb flare and SID correlations found by C. WARWICK suggests a more extended investigation of the nonspherically symmetric model and its relation to the chromospheric opacity in Lyman-α. *Subject Headings:* **1. Chromospheric structure 2. Lyman alpha observation.**—*Authors' abstract.*

11.11–29 523.742

†Athay, R. Grant (*Univ. Colorado*) and Orall, Frank Q. (*Sacramento Peak Obs.*), **Physical conditions in the solar limb prominence observed at the 1952 eclipse.** *Astrophysical Journal*, Chicago, 126(1):167–176, July **1957.** 3 figs., 4 tables, 22 refs., 11 eqs. **DWB, DLC**—At the time of the 1952 eclipse a small, rather faint, prominence was located near the equator on the west solar limb. REDMAN and ZANSTRA (1952) have previously discussed the continuous spectrum of this prominence, and in this paper we discuss the line spectrum. By combining the line data with the continuum data, we arrive at the following conclusions: 1) the optical thickness of the central part of the prominence in the center of $H\alpha$ is less than or near unity, and none of the observed hydrogen- and helium-line intensities are seriously affected by self-absorption; 2) the hydrogen energy levels and the helium triplet energy levels are overpopulated relative to the thermodynamic equilibrium populations at T_e; 3) helium is predominantly singly ionized; 4) T_e is near 20000° and $n_e \geq 10^{11}$; and 5) the prominence is in a steady state, with its radiated energy balanced by an external energy supply. *Subject Headings:* **1. Solar limb prominences 2. Solar eclipse, Feb. 1952.**—*Authors' abstract.*

11.11–30 523.745:550.38

Beard, David B. (*Dept. of Physics, Univ. of Calif., Davis and Lockheed Missiles and Space Div., Palo Alto*), **Interaction of the solar-plasma with the earth's magnetic field.** *Physical Review Letters*, N. Y., 5(3):89–91, Aug. 1, **1960.** 3 tables, 4 foot-refs., 5 eqs. **DLC**—The purpose of this Letter is to show how the magnetic field surrounding the earth is reshaped and terminated by the incident current of what amounts to a diamagnetic medium. ROSENBLUTH's treatment of the magnetic pinch is adapted to the problem. *Subject Heading:* **1. Solar plasma-magnetic field relationships.**—*E.Z.S.* Ⓢ

11.11–31 523.11/2

Egyed, L. (*Geophysical Inst., Eotvos Univ., Budapest*), **Dirac's cosmology and the origin of the solar system.** *Nature*, London, 186(4725):621–622, May 21, **1960.** fig., 2 refs., eqs. **DWB**—A hypothesis of the origin of the solar system is demonstrated by derivations of a series of equations and based on P. A. M. DIRAC's cosmology which was first rejected by physicists' opinion that his field theory featuring a non-constant gravity coefficient falls outside the limits of the general theory of relativity and on the revision of this opinion by C. GILBERT showing DIRAC's hypothesis as a corollary of this theory. Considering a state of a quite small

universe time parameter and assuming the maps of the solar system being concentrated in the sun the very great gravity acceleration in the sun resulting in a large scale pressure-dependent degeneration of matter supposes a sun of very small radius and of a very great angular velocity. The steady decrease of the centrifugal force and gravitational acceleration leads to instants when the two forces becoming equal, as illustrated by the graphs of the two functions, part of the solar mass can escape into the universe, forming a planet by its own gravitational attraction. The separation of the play of forces is due to the decrease of the solar radius and centrifugal force and to the greater gravitational acceleration of the remnant sun. The escaped masses will rotate on steadily widening orbits; the graph indicates an agreement with the law of TITIUS and BODE, and the hypothesis explains the fact that the older or outer planets are of smaller bulk density; it can be extended to the satellites of the larger planets and involves the possibility of the formation of rings and asteroids. *Subject Headings:* **1. Origin of solar system 2. Cosmology.**—*O.T.* Ⓢ

11.11–32 523.74/75

Koeckelenbergh, A., **Activité solaire en 1958.** [Solar activity during 1958.] *Ciel et Terre*, Brussels, 76(1/2):43–52, Jan./Feb. **1960.** plate, tables, 2 foot-refs. **DLC**—This article is composed of 3 parts: sunspots in 1958, chromosphere and prominences, and rapid transmission of observations. Systematic observation of sunspots was carried out during 1958 at the Royal Observatory of Belgium. The various data collected during each of the solar rotations and relating to the number of groups, the sunspot number, WOLF'S relative local number, etc. are shown in tables. A table gives WOLF'S relative daily local number; other tables supply information on the number of eruptions of various types, the number of brilliant upheavals on rim and disk, dark upheavals on the disk, eruptive prominences, sudden disappearances and active filaments observed at Uccle during the year 1958. *Subject Headings:* **1. Sunspots 2. Chromospheric prominences 3. Uccle, Belgium.**—*A.V.* Ⓢ

11.11–33 523.74/5:551.510.535:550.385.4 538.69:532.59

Michard, R., **Les éruptions du Soleil.** [Solar eruptions.] *L'Astronomie*, Paris, 74(3):97–111, March 1960. 3 figs., plate. **DLC, NNC, DWB**—This article constitutes an excellent and very comprehensive synthesis of the great progress made during the last years as regards the objective knowledge and understanding of solar eruptions. These very complicated phenomena find expression in the various layers of the solar atmosphere through temporary and diverse transformations shifted in time. The eruptions produce ultraviolet radiations, x-rays, cosmic rays and currents of electrified particles which propagate down to the earth. They influence the earth's magnetic field, the ionospheric phenomena and the radio wave propagation around the earth. The eruption of March 23, 1958 is followed step by step from the beginning of its observation; its characteristics are described and all the attendant geophysical perturbations are analyzed. The circumstances of solar eruptions are carefully examined; the author deals successively with eruptions in relation with groups of spots, localization of eruptions in the magnetic structure, and standard evolution of eruptions after spectroscopic data. The last part recapitulates the theory of eruptions. The most recent and most promising theory concerning the origin of eruptions is based on magnetohydrodynamics, i.e., on the mechanics of fluids in front of the magnetic field. *Subject Headings:* **1. Solar eruptions 2. Geophysical perturbation—solar eruption relationships 3. Magnetohydrodynamics theory.**—*A.V.* Ⓢ

11.11–34 523.75:551.521.64

Pomerantz, M. A.; Sandström, A. E.; Potnis, V. R. et al., **Solar disturbances and the cosmic ray equator.** *Tellus*, Stockholm, 12(2):231–235, May **1960.** 5 figs., table, 3 refs. **DWB, DLC**—The location of the cosmic ray equator off the west coast of Africa has been established from measurements obtained with a shipboard neutron monitor which made ten crossings between Nov. 1956 and Oct. 1958. From the individual determinations of the point of minimum cosmic ray intensity, the mean geographical position was 6.7±0.8°N at 14°W. Direct measurements of zero magnetic inclination were made at the same time in the immediate vicinity of this point. Although solar and geophysical activity varied considerably during this period, the location of the cosmic ray equator appears to have remained fixed within approximately 1°. However, the possibility of a small progressive change of about the magnitude

of the uncertainty cannot be precluded. Comparison of the results with plots of measurements of the magnetic elements along the ship's route reveals a significant difference between the location of the points of maximum horizontal intensity and minimum cosmic ray intensity. *Subject Headings:* **1. Solar disturbances 2. Cosmic ray equator. I. Rose, D. C.**—*Authors' abstract.* Ⓢ

11.11–35 551.507.321:522.2:523.746:778.3

Raimond, J. J., Jr., **Foto's van zonnevlekken scherper dan alle vroegere.** [Photographs of sunspots sharper than all earlier ones.] *Hemel en Dampkring*, The Hague, 58(1):1–10, Jan. **1960.** 7 figs. **DWB, DLC** -Account of the sunspot photographs, taken by M. SCHWARZSCHILD and his collaborators of the Princeton University Observatory. The photographs were taken with a telescope hanging on a balloon, which was sent into the stratosphere to a height of about 25 km. Experimental photographs were taken on 25 Sept. 1957, and 8000 images 35 mm film were obtained. Only some ten were sharp. This was due to the movement of the motor and the telescope directed automatically on the sun. But the good seeing visibility in the rarefied atmosphere was proved. On 17 Aug. 1959 the same telescope with corresponding but improved instruments was sent in the stratosphere. For selection of sunregions, T.V. and distance control was used. The result was 400 minute photographs. They proved the enormous gain of sharpness when the telescope is above the lowest and densest part of the atmosphere which is continuously in motion and thus the "earth" photographs become hazy. A figure gives a description and the mechanism of the telescope used. Four photographs of sunspots were shown and discussed, together with a brief account of granules, pores and sunspots. *Subject Headings:* **1. Sunspot observation 2. Sunspot photographs 3. Balloon-borne telescopes 4. Princeton Univ. Observatory, Princeton, N. J.**—*A. V.* Ⓢ

11.11–36 523.74/75

Waldmeier, M., **Die Sonnenaktivität im Jahre 1958.** [Solar activity during the year 1958.] *Naturforschende Gesellschaft in Zurich, Vierteljahresschrift*, 104(3):345–378, Aug. 31, **1959.** 8 figs., 14 tables, 2 refs. **DLC**—The present paper gives the frequency numbers of sunspots, photospheric faculae, flares and prominences as well as the intensity of the coronal line 5303 Å and of the solar radio emission at the wave length of 10.7 cm, all characterizing the solar activity in the year 1958. Tables give the daily values of the relative-numbers, of the group-numbers and of the radio emission and the distribution in latitude of the spots, faculae, flares, prominences and of the coronal intensity. Figs. show the course of the relative-numbers and of the radio emission, and the distribution in latitude of the spots, faculae, prominences and of the coronal intensity. The maximum of the smoothed sunspot cycle occurred in 1957–59. *Subject Headings:* **1. Solar activity 2. Sunspots 3. Chromosphere and prominences.**—*A. V.* Ⓢ

3. PLANETS

11.11–37 551.510:523.4

Urey, H., **Pervonachal'nye atmosfery planet.** [Initial planetary atmospheres.] *Priroda*, Moscow, No. 4:33–38, April **1959.** eq. **DLC**—This report on the origin of planetary atmospheres was presented by HAROLD C. UREY (well known American physicist), at the International Symposium on the Origin of Life on the Earth in August 1957 in the U.S.S.R. The history of the atmosphere of the earth and of the planets Venus and Mars are discussed. It is concluded that large quantities of water had probably occurred on the surface of all three planets and that the existing high temperatures were no obstacle for the development and the sustaining of life on these planets. *Subject Heading:* **1. Planetary atmospheres.**—*A. M. P.* Ⓢ

4. METEORS

11.11–38 523.53:550.386

Campbell, Wallace H. (*Univ. Alaska*), **Magnetic micropulsations accompanying meteor activity.** *Journal of Geophysical Research*, Wash., D. C., 65(8):2241–2245, Aug. **1960.** 4 figs., 2 tables, 18 refs. **DLC**—Increased activity of magnetic micropulsations with periods of 5 to 30 seconds and magnetic flux densities of 20 to 320 mγ was found to accompany the η Aquarid,

δ Aquarid, and Perseid meteor showers in 1958. Conflicting reports are discussed. *Subject Heading:* **1. Meteor shower effects on magnetic micropulsations.**—*Author's abstract.* Ⓢ

11.11–39 523.51:551.507.362,2

Dubin, Maurice (*AF Cambridge Res. Ctr.*), **Meteoritic dust measured from Explorer I.** *Planetary and Space Science*, N. Y., 2(2/3):121–129, April **1960.** 11 figs. (incl. photos), table, 9 refs. **DWB**—The impacts of micrometeorites upon the cylindrical shell of the satellite Alpha 1958 were monitored by a calibrated piezo-electric detector. Results of these measurements are presented, including a description of the instrumentation, the calibration procedure, and the amount and type of data recorded at the ground stations. The total data sample over a period of 12 days of telemetering consisted of 78,890 sec of telemetered data with an excellent signal to noise ratio. During this time 153 signals denoting impacts by micrometeorites were recorded. This is equivalent to 1.7×10^{-2} impacts/m²/sec on the earth. The calibration indicates that for a mean impact velocity of 30 km/sec the particles striking the satellite had a mass of 8×10^{-10} g or larger, if no large deviations in momentum transfer occur during the formation on hypervelocity craters. Thus, the accretion rate of extraterrestrial dust upon the earth may be estimated at 10,000 tons/day during the month of February 1958. A variation from day to day of the influx rate as large as an order of magnitude is evident from the data. A "shower" of dust particles has been found for the third day in orbit. A variation of the influx of particles may also be attributed to a diurnal effect from the earth's rotation and its heliocentric velocity. *Subject Headings:* **1. Meteoritic dust measurement 2. Satellite measurement of meteoritic dust 3. U. S. satellite, 1958 Alpha (Explorer I).**—*Author's abstract.* Ⓢ

11.11–40 523.51:533.6

†Gazley, Carl, Jr. (*Rand Corp.*), **Meteoric interaction with the atmosphere; theory of drag and heating and comparison with observations.** *Rand Corporation, Santa Monica, (Publication)* R-339, **1959.** Paper No. 6 (58 p.). 22 figs., 2 tables, 21 refs., 21 eqs. **DWB** (M10.5 R186ae)—The entry of meteoroids into the earth's atmosphere involves velocities higher than presently available in any terrestrial laboratory facility. While meteoric interaction with the atmosphere obviously does not provide a controlled type of experiment and many of the test conditions must be deduced indirectly, it offers the opportunity of aerodynamic data at extreme velocities and altitudes. Extensive observations of meteor velocity, luminosity, and altitudes, together with atmospheric-density observations, now enable certain deductions to be made about the aerodynamic drag and heating. In this paper, comparison is made between meteor theory and observations in an attempt to obtain information about the mechanisms of aerodynamic drag, aerodynamic heating, and surface ablation. General analytical expressions are developed for meteoroid deceleration, mass loss, and luminosity. The results of this analysis are expressed in terms of the observational quantities and compared with the more reliable measurements. This comparison indicates that the extension of conventional free-molecule aerodynamics to the meteor case appears to be justified. *Subject Headings:* **1. Meteoric physics 2. Aerodynamic drag and heating.**—*Author's abstract.* Ⓢ

D. OUTER ATMOSPHERE

1. COSMIC RADIATION

See also: **Cosmic ray equator** (Pomerantz et al.), 11.11–34; **Cosmic ray research** (Lequeux), **11.11–83; Cosmic radiation** (Schulze), 11.11–179.

11.11–41 523.165:551.521.64

Das, A. K. and Narayana, J. V. (*both, Kodaikanal Obs., Kodaikanal*), **Momentary bursts of cosmic radiation.** *Indian Journal of Meteorology and Geophysics*, New Delhi, 11(1):50–56, Jan. **1960.** table, 6 refs. **DWB, DLC**—A standard Kolhorster cosmic ray apparatus with photographic recorder has been in continuous operation since March 1956. A table gives the dates of momentary bursts of cosmic radiation, the time, voltage drop during burst, solar

flares, solar radio emissions and radio fade-outs which occurred simultaneously or within reasonable time to be thought to be associated. It seems probable that every solar flare is accompanied by emission of cosmic rays and these are greatly dispersed by the local magnetic field of the spots and are further deviated by the magnetic field of the earth. *Subject Heading:* **1. Cosmic ray bursts.**—*E.Z.S* Ⓢ

11.11–42 551.521.64:551.590.21

Gerasimova, N. M. and Zatsepin, G. T., **Rasshcheplenie iader kosmicheskikh luchei fotonami Solntsa.** [Disintegration of cosmic ray nuclei by solar photons.] *Zhurnal Eksperimental'noĭ i Teoreticheskoĭ Fiziki*, Moscow, 38(4):1245–1252, **1960.** 3 figs., 2 tables, 14 refs., 27 eqs. Russian summary p. 1245; English summary p. 1252. **DWB, DLC.** Transl. into English available in corresponding issue of *Soviet Physics JETP*, N. Y.—A calculation is made of the effect of disintegration of cosmic ray nuclei in the field of solar photons leading to formation of correlated showers in the atmosphere. The energy of the disintegrated nuclei is found to be of the order of 10^{16} eV per nucleon and their flux is of the order of $10^{-4}-10^{-3}$ km^{-2} hour^{-1} sterad.$^{-1}$ as a result of divergence of the photonuclear disintegration products before they enter the atmosphere; the distance between the cores turns out to be of the order of approximately 1 km. The scheme of the movement of the particles is illustrated. Data for He^4, C^{12}, N^{14}, O^{16}, Te^{56} are tabulated. Curves show graphically the relationships between the particles. *Subject Headings:* **1. Solar effects on cosmic rays 2. Cosmic ray showers.**—*E.Z.S.* Ⓢ

11.11–43 551.521.64:537.591.1

Powell, C. F., **Studies of cosmic radiation.** *Institution of Electrical Engineers, Journal*, 6(65):290–292, May **1960.** 2 figs. "51st Kelvin Lecture meeting of the Institution." (Note: this is merely a summary of the Kelvin Lecture, which will be published in full in the **Proceedings** of the Institution.) **DLC**—Powell introduced his subject by summarizing what is already known of the origin and nature of cosmic radiation. He referred to the unequal distribution of elements—the evolution of super-nova and the isotropic nature of cosmic rays. Cosmic rays are thought to be generated in the relics of super-novae. The primary particles injected into the galactic halo suffer random deflection in passing through the randomly oriented magnetic fields. Their directions of motion are thus rendered isotropic. As they pass through the gas of the halo the original particles may make collisions with the nuclei of the diffused gas. The heavier nuclei will sometimes fragment, and among the products will be some nuclei of lithium and other light elements. The light elements are introduced into the stream of particles reaching earth. A picture of a polythene balloon before launching is shown. *Subject Heading:* **1. Cosmic ray theories.**—*E.Z.S.* Ⓢ

11.11–44 551.521.64

Holzapfel, L., **Untersuchungen im Zusammenhang mit dem ungewöhnlichen Intensitätsanstieg der "Kosmichen Reststrahlung" in den monaten Juli/August 1959.** [Research in relation with the unusual intensity increase of residual cosmic radiation (Reststrahlung) during July/August 1959.] *Naturwissenschaften*, Berlin, 47(6):130–131, March 31, **1960.** fig., 3 refs. **DLC**—Activity measurements by Geiger counter, over a long period have shown general constant values of residual cosmic radiation: 13 to 18 impulses/min with maximum not above 20 imp/min. Measurements have been made in a dark underground area with constant relative temperature. At the end of June a sensible increase of the values was observed, after the measurements of residual cosmic radiation had been made with great care. 1958 showed some increases in July/August but distinctly inferior with regard to the same period in 1959. The increase in August 1959 exceeded the increase in July 1959 as to intensity and duration. A fig. gives the values of residual cosmic radiation for July/August 1958 and another one the values for July/Sept. 1959. *Subject Heading:* **1. Residual cosmic radiation.**—*A.V.* Ⓢ

11.11–45 551.521.64

Charakhch'ian, A. N.; Tulinov, V. F. and Charakhch'ian, T. N., **Sluchaĭ bol'shikh vozmushcheniĭ intensivnosti kosmicheskikh luchei v stratosfere.** [Large cosmic ray intensity fluctuations in the stratosphere.] *Zhurnal Eksperimental'noĭ i Teoreticheskoĭ Fiziki*, Moscow, 38(4):1031–1036, **1960.** 4 figs., 8 refs. Russian summary p. 1031; English summary p. 1036.

DWB, DLC. Transl. into English available in corresponding issue of *Soviet Physics JETP*, N. Y.—The energy spectrum of an additional proton flux which exceeded the normal value by more than 20 times was derived on the basis of stratosphere measurements. The exponent of the differential spectrum is equal to 6.0 in the 120–170 MeV energy range. These protons are due to corpuscular beams (with) frozen magnetic fields emitted during the solar chromosphere flare on May 10, 1959. Data for March 11–13, 1959 to July 8, 1959 are plotted. The curve for differential spectrum of protons is given, and the data for March 12, 1959 are plotted. *Subject Headings:* **1. Cosmic ray intensities 2. Cosmic ray events at high altitude.**—*E.Z.S.* Ⓢ

11.11–46 551.521.64

Forbush, Scott E. (*Carnegie Inst. of Wash.*) and Venkatesan, D. (*Natl. Res. Council of Canada*), **Diurnal variation in cosmic-ray intensity, 1937–1959, at Cheltenham (Fredericksburg), Huancayo, and Christchurch.** *Journal of Geophysical Research*, Wash., D. C., 65(8): 2213–2226, Aug. **1960.** 9 figs., 7 tables, 4 refs., 2 eqs. **DLC**—The 24-hr and 12-hr waves in cosmic ray intensity at Cheltenham (Fredericksburg), Huancayo, and Christchurch and their variability are analyzed statistically, using data, corrected for pressure, for the period 1937–1959 from Compton-Bennett ionization chambers. The degree of correlation between the deviations of yearly mean 24-hr waves (from their 23-yr means) at any two of the stations is almost as great as can be expected when account is taken of the noise level inherent in the instruments. The deviations of yearly means, from their 23-yr averages, indicate large secular variations which may be due to a quasi-systematic 22-yr variation. The phase difference between these yearly deviation vectors at Huancayo and Cheltenham (or Christchurch) is considerably less than that between the average vectors for 23 yrs. The statistical reality of the 12-hr wave is definitely established at all three stations, although, at least at Huancayo, the average 12-hr wave probably results entirely from systematic errors due to exceedingly small frictional effects in the barograph. *Subject Headings:* **1. Diurnal cosmic ray variations 2. Cosmic ray intensities.**—*Authors' abstract.* Ⓢ

11.11–47 551.521.64:537.591.1

Kerlee, D. D.; Krienke, O. J., Jr. (*both, Seattle Pacific College Inst. for Research, Seattle*); Lord, J. J. (*Dept. of Physics, Univ. of Washington, Seattle*) et al. **Cosmic-ray heavy nuclei at the geomagnetic equator.** *Physical Review*, N. Y., 118(3):828–830, May 1, **1960.** 2 figs., 2 tables, 11 foot-refs. **DWB**—The flux of primary cosmic ray heavy nuclei has been measured with an sandwich of C-2 and G-5 emulsions near the island of Guam, mag. lat. 4°N. The emulsions were exposed at about 101,000 ft for 7.3 hrs and the calculated fluxes at the top of the atmosphere in particles/m²-sec-sr were found to be:

Li, Be, B (L nuclei)	0.26±0.05,
C, N, O, F (M nuclei)	0.66±0.10,
Z>10 (H nuclei)	0.37±0.09.

The flight took place on Feb. 12, 1957, about a year prior to the sunspot maximum; however, there is no evidence within statistical error for any changes in the composition of the primary heavy nuclei. *Subject Headings:* **1. Primary cosmic rays 2. Cosmic ray measurement techniques 3. Guam. I. Nelson, M. E.**—*Authors' abstract.* Ⓢ

2. IONOSPHERE

11.11–48 551.510.535:551.594.13

Aikin, A. C., **Preliminary study of sunrise effects in the D-region.** Pennsylvania. State Univ. Ionosphere Research Laboratory, Contract AF 19(604)-4563, Scientific Report, No. 133, June 1, **1960.** 28 p. 10 figs., 11 refs., numerous eqs. **DWB** (M10.535 P415i)—A theoretical determination is made of the electron density distribution in the region between 60 and 100 km for times around sunrise. It is shown that the radiations responsible for ionization are Lyman alpha acting on NO and cosmic ray ionization of O_2 and N_2. This leads to a twilight D region consisting of two strata. The upper layer is under direct solar control, increasing as the optical depth at Lyman alpha decreases. After an initial increase due to photodetachment

from O_2^- the lower region, formed by cosmic rays, remains constant. A comparison is made between this model and the behavior of the ionosphere deduced from low and very low frequency radio soundings. *Subject Headings:* **1. D region 2. Ionospheric electron density distribution 3. "Sunrise effects" on ionosphere.**—*Author's abstract.* Ⓢ

11.11–49 551.510.535:550.385

Bibl, K. (*Ionosphären-Institut Breisach Deutsche Bundespost, Germany*), **Dynamic characteristics of the ionosphere and their coherency with the local and planetary magnetic index.** *Journal of Geophysical Research*, Wash., D. C., 65(8):2333–2342, Aug. **1960.** 3 figs., 4 tables, 11 refs. **DLC**—With some new definitions, dynamic parameters of the ionosphere can be obtained from direct recordings of ionospheric characteristics. Four parameters were adopted and evaluated every day in 1959. These parameters enable us to detect some relations existing between the intensity of sporadic E ionization, the movement of the F ionization, and the magnetic character figures, both local and planetary. Quiet days as defined from ionospheric parameters are not more frequent than disturbed ones. The following results have been obtained by the methods of partial correlation: 1) When E_3 ionization appears there are at the same time important height fluctuations of the F ionization. With an intense E_3 the F ionization is blown up to greater altitudes additionally. A good correlation exists between the intensity of E_3 ionization and the amplitude of the height fluctuations in F ionization. 2) The fluctuations of the terrestrial magnetic field are also correlated with those of the F ionization which are produced at about the same time; the amplitude of the fluctuations of the F ionization increases monotonically with the intensity of magnetic activity. 3) E_3 ionization has a 'calming' effect on the magnetic field; it decreases fluctuations. We suppose this to be a local screening effect of the E_3 layer. The high correlation between local and planetary magnetic perturbations could be explained by the relations existing between these two parameters and the height fluctuations of F ionization. Until now simple correlations have in general been calculated considering only one ionospheric and one magnetic parameter. We separate the effects of E_3 on the one hand and height fluctuations of F ionization on the other by the method of partial correlation. *Subject Headings:* **1. Ionospheric dynamics 2. Magnetic index 3. Magnetic effects on ionosphere.**—*Author's abstract.* Ⓢ

11.11–50 551.510.535:551.510.62

†Davies, Kenneth (*Natl. Bur. of Stands., Boulder, Colo.*), **A study of 2-Mc/s ionospheric absorption measurements at high latitudes.** *Journal of Geophysical Research*, Wash., D. C., 65(8):2285–2294, Aug. **1960.** 7 figs., 3 tables, 20 refs., 7 eqs. **DLC**—Ionospheric absorption (L) at high latitudes is studied using the published data on 2.0 Mc/s at five Canadian stations during 1957 and 1958. The seasonal and diurnal variations are considered, and it is found that a pronounced winter anomaly in noon absorption occurs at Churchill but not at Resolute Bay. The diurnal variations indicate that the dependence of absorption on solar zenith angle decreases with increase of latitude. The distribution of midnight absorption with latitude shows that, although the maximum occurs in the auroral zone, high absorption is also encountered over the polar cap. A study of the duration of long-lasting blackouts shows that in summer the duration is longer as the latitude increases. *Subject Headings:* **1. Ionospheric absorption measurement techniques 2. Diurnal ionospheric variations.**—*Author's abstract.* Ⓢ

11.11–51 551.594.12:551.510.535(213)

†Egan, R. D. (*Stanford Univ.*), **Anisotropic field-aligned ionization irregularities in the ionosphere near the magnetic equator.** *Journal of Geophysical Research*, Wash., D. C., 65(8):2343–2358, Aug. **1960.** 17 figs., 22 refs., 17 eqs. **DLC**—During the 1958–1959 International Geophysical Year, a three-frequency swept-azimuth backscatter sounder was operated by Stanford University at Huancayo, Peru, in cooperation with the Institute Geofisico de Huancayo. An unusual echo, which has been shown to be due to the presence of field-aligned ionization irregularities in the ionosphere, was discovered early in the program. These equatorial scatter echoes (EqS) are observed on over 90 per cent of the days (at 18 and 30 Mc/s) and exhibit a diurnal variation very similar to that of the equatorial electrojet. By means of the backscatter pulse observations, in conjunction with the Booker theory of backscattering from anisotropic field-aligned irregularities, it has been possible to determine the

size and extent of the scattering region. The E-region echoes originate at heights between 100 and 140 km. At times, however, the upper limit may extend to 200 km or more. F-region echoes have occasionally been observed which appear to originate at heights correponding to the maximum ionization density of the layer. Observations of the strength of the EqS echoes indicate that the mean square fractional deviation of the electron density $(\Delta N/N)^2$ is between 10^{-3} and 10^{-5}. The discovery of the presence of equatorial field-aligned ionization irregularities has made it possible for the first time to describe adequately a number of equatorial ionospheric phenomena, including the mechanism of 'equatorial-type' sporadic E. *Subject Headings:* **1. Ionospheric ionization 2. Equatorial ionosphere.**—*Author's abstract.* Ⓢ

11.11–52 551.594.12:551.510.535:541.12

Gliddon, J. E. C. (*Queen Mary College, Eng.*) and Kendall, P. C. (*Bedford College, Eng.*), **The effects of diffusion and of attachmentlike recombination on the *F2* region.** *Journal of Geophysical Research*, Wash., D. C., 65(8):2279–2283, Aug. **1960.** 4 figs., 3 tables, 8 refs., 9 eqs. **DLC**—Using formulas developed in previous papers (Gliddon, 1959; Gliddon and Kendall, 1960), we obtain quantitative results for the diurnal variation of electron density in the F2 region, taking account of diffusion and of an exponentially decreasing attachment-type law of recombination. The atmosphere is assumed to be isothermal, and for the case considered here (middle latitude) the effect of the geomagnetic field on diffusion is small enough to be ignored. *Subject Headings:* **1. Electron density in F2 region 2. Ionospheric electron diffusion 3. Recombination in F region.**—*Authors' abstract.* Ⓢ

11.11–53 551.510.535:551.524.7:551.547.5:551.557

Johnson, Francis S. (*Lockheed Missiles and Space Div., Palo Alto, Calif.*), **Pressure and temperature equalization at 200-km altitude.** *Journal of Geophysical Research*, Wash., D. C., 65(8):2227–2232, Aug. **1960.** 2 figs., 8 refs. **DLC**—Atmospheric pressure at 200 km must be nearly constant over the entire earth as a result of large-scale air motions which can occur in the ionosphere. In the lower atmosphere, adjacent areas of high and low pressure can exist without annihilation by pressure equalization; direct air flow from high to low pressure does not occur, because balanced circulations develop in which inertial forces (centrifugal and Coriolis) balance the pressure forces and prevent equalization. At altitudes near 200 km, viscous forces prevent the balanced circulations from occuring, so pressure equalization can proceed rapidly. The heat transport associated with the air motion is large and tends to bring about temperature equalization also. At still higher altitudes, the heat content and the pressure forces are smaller but the viscous forces for a given velocity shear remain unchanged, making possible the existence of pronounced high-pressure areas in regions of local heating. The conclusion reached in this study does not permit one to accept the frequently held concept that the polar or auroral zone ionosphere is much warmer than the equatorial ionosphere with pressures at 200 km several times larger in the polar regions (e.g., at Churchill, Canada) than at temperate and low altitudes (e.g., at White Sands, New Mexico). *Subject Headings:* **1. Ionospheric temperature equalization 2. Ionospheric movements 3. Pressure equalization.**—*Author's abstract.* Ⓢ

11.11–54 551.510.535:551.594.13:551.507.362.2:621.396.8

Little, C. Gordon and Lawrence, Robert S., **The use of polarization fading of satellite signals to study the electron content and irregularities in the ionosphere.** *U. S. National Bureau of Standards, Journal of Research, Sec. D*, 64(4):335–346, July/Aug. **1960.** 11 figs., 15 refs., 4 eqs. **DWB, DLC**—A procedure is described for using the Faraday-rotation fading of a satellite radio signal to measure the ionospheric electron content per unit column up to the height of the satellite. At frequencies as low as 20 Mc the rotation of the plane of polarization cannot be assumed to be proportional to $\rho NB \cos \theta d$ along the line of sight. The simplifying assumptions implied by this expression are avoided, and full account is taken of ionospheric refraction, using the collision-free form of the Appleton-Hartree equation. Results based on observations of 1958 Delta 2 are presented. The subsatellite electron contents have been derived throughout the satellite passes for heights both above and below the F-peak, the latter compare well with values derived from simultaneous ionograms. The method also permits the study of large-scale irregularities in electron content. Such irregularities, having lateral

dimensions of a few hundred kilometers and fractional deviations in subsatellite electron content of about 0.01, have been detected. Our observations suggest that satellite polarization studies offer important advantages over other methods of investigating these irregularities. *Subject Headings:* **1. Ionospheric radio wave polarization 2. Radio fading 3. Satellite ionospheric electron density measurements.**—*Authors' abstract.* Ⓢ

11.11–55 551.510.535

Oksman, Juhani O. and Bowhill, Sidney A., **Correlation studies of the Es region.** Pennsylvania. State University. Ionosphere Research Laboratory, Contract AF 19(604)-4563, Scientific Report, No. 132, May 1, 1960. 48 p. 16 figs., tables, 15 refs., 23 eqs. **DWB** (M10.535 P415i)—In studying the sporadic E region, two approaches are possible: either its world-wide occurrence, or the behavior of separate Es "clouds" may be studied. A dense network of observing stations is ideally needed for the latter approach. Since this network is not available, a statistical method is developed which gives the average time and space structure of Es clouds. Unlike conventional statistical methods, allowance is made for gaps in the measured sets of values of foEs caused by various complicating factors. The autocorrelation coefficients, as functions of time and space, of a new quantity fiEs, with an assumed Gaussian probability distribution, have been calculated from observed Es data. The results indicate that Es clouds have sharp edges; that Es occurrences last frequently for more than four hours; that correlation exists between Es occurrences at places more than 700 km apart; and that the direction of apparent Es movements is random, with a velocity of about 70 m/sec. Further use of this method on a world-wide basis is recommended. *Subject Heading:* **1. Sporadic E layer (Es).**—*Authors' abstract.* Ⓢ

11.11–56 551.510.535:621.396.8

Renau, Jacques (*Cornell Aeronautical Lab., Buffalo, N. Y.*), **Theory of spread *F* based on aspect-sensitive backscattered echoes.** *Journal of Geophysical Research*, Wash., D. C., 65(8): 2269–2277, Aug. 1960. 10 figs., 5 refs., 14 eqs. **DLC**—To explain spread echoes from the F region the concept of aspect sensitivity was incorporated in our derivations of *h'f* curves using the assumption that the magnetoionic components can be treated separately. The shape of the *h'f* curves, as well as the extent of range and frequency spreading, was deduced for ionospheric stations located at various magnetic latitudes. The requirements of aspect sensitivity restrict the solid angle containing the echo rays to a wedge with its apex line running east-west through the transmitter location and with its angle determined by the dip angle. At the magnetic north the wedge opens flat, and at the magnetic equator the wedge degenerates into an east-west flat fan. The model does not lead to an explanation of a large class of observed spread F in the northern and middle latitudes. At the magnetic equator, however, the model is potentially capable of clarifying the observed spread F of a type shown in this paper. *Subject Heading:* **1. Spread F echoes.**—*Author's abstract.* Ⓢ

11.11–57 551.510.535:551.510.62:621.396.11

Watts, J. M. and Davies, Kenneth (*both, Natl. Bur. of Stands., Boulder, Colo.*), **Rapid frequency analysis of fading radio signals.** *Journal of Geophysical Research*, Wash., D. C., 65(8):2295–2301, Aug. 1960. 5 figs., 2 refs. **DLC**—Examples of frequency analysis of fading radio signals for long periods of time are demonstrated, and the method of obtaining them is explained. They include both regular HF propagation and VHF ionospheric forward-scatter samples. The procedure is also useful for the analysis of other natural phenomena having long time scales and slow variations. *Subject Headings:* **1. VHF radio wave scattering 2. Ionospheric radio wave propagation 3. Radio fading.**—*Authors' abstract.* Ⓢ

11.11–58 551.510.535

Weekes, K. (*Cavendish Lab., Cambridge, Eng.*), **Introduction to discussion on theoretical explanation of sporadic *E*.** *AGARDograph*, Paris, No. 34:195–196, Sept. 1958. fig. **DWB** (629.1323 N864a)—A discussion of the main forms of Es is proposed. These may be distinguished into five types: 1) the blanketing type, 2) the transparent type, 3) nighttime Es, 4) auroral Es, and 5) equatorial Es. Later a classification is suggested for the theories which

may be put forward to explain the appearance of Es according to those which involve an extra process of ion production and those which involve redistribution of the existing ionization. Further detail of what these two categories may include is given. *Subject Heading:* **1. Sporadic E layer (Es).**—*I.S.*

11.11–59 551.510.535:551.510.62:621.396.11

Weisbrod, S. (*Smyth Res. Assoc., San Diego, Calif.*) and Colin, L. (*Griffiss AF Base, Rome, N. Y.*), **Refraction of very high frequency radio signals at ionospheric heights.** *Nature*, London, 184(4680):119, July 11, 1959. fig., 2 refs. **DWB**—A note and a graphical representation related to the subject of refractive errors caused by the Earth's atmosphere in the elevation angle determination. It is shown that in the case of radio tracking of space vehicles, the refractive errors due to the troposphere rapidly decrease with an increase in the elevation angle, while those due to the ionosphere initially increase with the elevation angle, and then gradually fall off. *Subject Headings:* **1. Ionospheric radio wave refraction 2. VHF radio wave propagation.**—*I.S.* Ⓢ

11.11–60 551.510.535:551.510.62:551.551.5

Wheelon, Albert D., **Relation of turbulence theory to ionospheric forward scatter propagation experiments.** *U. S. National Bureau of Standards, Journal of Research, Sec. D*, 64(4):301–309, July/Aug. 1960. 7 figs., 32 refs., numerous eqs. **DWB, DLC**—This paper attempts to relate turbulence theories to radio measurements on VHF ionospheric forward scatter circuits. To this end, the single scattering description of the electromagnetic response of electron density irregularities and the corresponding transmission expression are evaluated. Statistical distribution of signal levels are found to agree with a scattering model. The several theories for turbulent mixing of the electron density are then summarized. A turbulence mixing model is compared favorably with experimental data on absolute signal levels and their diurnal and seasonal variations. Scattering heights in the ionosphere responsible for the signals are also consistent with these theories. Frequence and distance dependence scaling laws are compared briefly with the data. The scatter signal behavior during sudden ionospheric disturbances is also explained. No attempt is made to compare meteoric and turbulence scatter contributions to the measured quantities in this paper. Approximately thirty references are given. *Subject Headings:* **1. Ionospheric radio wave scattering 2. Turbulence in the ionosphere.**—*Author's abstract.* Ⓢ

11.11–61 551.510.535

Wright, J. W. and Gautier, T. N., **Note on a test of the equivalence theorem for sporadic E propagation.** *U. S. National Bureau of Standards, Journal of Research, Sec. D*, 64(4):347–348, July/Aug. 1960. fig., 6 refs. **DWB, DLC**—Analysis of two days (123 cases) of sporadic E observed simultaneously at oblique and vertical incidence verifies that the classical sec Φ relationship between top frequencies is roughly appropriate for sporadic E. *Subject Heading:* **1. Sporadic E layer (Es).**—*Authors' abstract.* Ⓢ

11.11–62 551.510.535:537.2:551.590.21:551.594.18:523.75

†Zmuda, Alfred J. (*Johns Hopkins Univ., Md.*), **Ionospheric electrostatic fields and the equatorial electrojet.** *Journal of Geophysical Research*, Wash., D. C., 65(8):2247–2253, Aug. 1960. 27 refs., 8 eqs. **DLC**—The electrostatic characteristics associated with the equatorial electrojet are investigated with the aid of a number of theoretical and experimental considerations. With regard to peak electrojet current, an eastward component of electric force of magnitude 4×10^{-4} volt/m drives a current of density 10^{-5} amp/m^2. In the region of maximum current the ionosphere is electrically neutral, but the electric field is created by an electrostatic charge distribution with an excess of electrons in the region east of the point with peak current and an excess of positive charges in the region to the west. The maximum of the difference in the number density of the negative and positive charges is 5×10^{-2} charge/m^3 for the volume density, and 9×10^4 charge/m^2 for the surface density on the lower boundary of the E layer. These number differences, which represent extremely small departures from electrical neutrality in the ionosphere, indicate the prime importance of a surface charge distribution in producing the ionospheric electrostatic field. The vertical component of the electrostatic force has a

maximum value of 4×10^{-4} volt/m but vanishes at the point containing the peak electrojet current. *Subject Headings:* **1. Ionospheric electric fields 2. Equatorial electrojet 3. Electrostatics.**—*Author's abstract.* Ⓢ

3. AURORAS

See also: **Auroral particles** (Lequeux), **11.11–83.**

11.11–63 551.594.5:621.396.8

Buyse, C., **Les aurores et leurs relations avec certaines observations radioélectriques.** [Auroras and their relations with certain radioelectric observations.] *Ciel et Terre*, Brussels, 76(1/2):36–41, Jan./Feb. **1960.** 13 refs. **DWB, DLC**—The radioelectric observations made n the Observational Network by members of the Belgian Amateur Broadcasters Union for the IGY consist of monitoring and evaluation of the reception intensity of a certain number of broadcasting stations at long waves (200 to 300 Kc/s) and decameter waves (2500 to 15,000 Kc/s). Great auroras occurred in the two hemispheres at the beginning of the second decade of February 1958; the observations made by the author from Feb. 9 to 13, 1958 have shown the effects that one associates with auroras: increase of the intensity of long wave reception; bad propagation of decameter waves and reception of stations rarely heard owing to distance or weak power. *Subject Headings:* **1. Auroral observations 2. Radio frequency disturbances.** —*A. V.* Ⓢ

11.11–64 551.501.81:551.594.5:621.396

Flood, Walter A. (*Cornell Aeronautical Lab., Buffalo, N. Y.*), **Simultaneous VHF auroral backscatter measurements.** *Journal of Geophysical Research*, Wash., D. C., 65(8):2261–2268, Aug. **1960.** 6 figs., 3 tables, 3 refs., eqs. **DLC**—Simultaneous auroral echoes at 49.7, 143.5, and 226 Mc/s have been recorded using scaled radar equipments. Analysis indicates that the wave length dependence of auroral echoes varies from $\lambda^{3.5}$ for frequencies of 49.7 and 143.5 Mc/s to $\lambda^{6.5}$ for frequencies of 143.5 and 226 Mc/s. These measurements are in reasonable agreement with Booker's theory of auroral echoes if the scale sizes (measured transverse to the magnetic field) are taken as roughly 40 cm. Evidence for nondeviative absorption at 50 Mc/s is also adduced. *Subject Headings:* **1. Radar echoes from auroras 2. Radio wave reflection from auroras 3. VHF radio wave scattering.**—*Author's avstract.* Ⓢ

11.11–65 551.501.81:551.594.5(747)

Gartlein, C. W.; Sprague, G. and Waag, R. C. (*all, Cornell Univ.*), **41 Mc/s IGY auroral radar at Ithaca, New York.** *Journal of Geophysical Research*, Wash., D. C., 65(8):2255–2259, Aug. **1960.** 7 figs., table, 5 refs. **DLC**—The IGY records taken on the 41-Mc/s auroral radar at Ithaca have been compared with visual observations. It appears that the radar consistently detects auroras between 500 and 1200 km north of Ithaca and can therefore be used to study auroral statistics in this region. Specific studies have been made of the latitude distribution and the diurnal distribution. Many unidentified, nonauroral echoes are present. *Subject Headings:* **1. Radar echoes from auroras 2. Auroral distribution 3. Ithaca, N. Y.**—*Authors' abstract.* Ⓢ

11.11–66 551.594.51

Harang, Ove, **Investigation of the state of polarization of the red and green O-lines in polar aurorae.** *Oslo, Universitet. Instituut for Teoretisk Astrofysikk, Blindern, Report*, No. 11, Feb. **1960.** 15 p. 5 figs., 2 refs. **DWB** (M93.7 O82re)—The state of polarization of the lines 6300 and 5577 Å in polar auroras is investigated. It is shown that during favorable conditions it is possible to decide that the difference in amount of vertical and horizontal linear polarization must be less than 1%. It is also shown that no circular polarization appears when viewed in the direction toward magnetic zenith. The conclusion is that the red and green lines emitted from polar aurora of considerable strength show no polarization. *Subject Headings:* **1. Polar incidence of aurora 2. Spectral line 5577 Å 3. Red auroral line.**—*Author's abstract.* Ⓢ

4. GEOMAGNETISM

See also: **Meteor effects on magnetic micropulsations** (Campbell), 11.11–38; **Magnetic effects on ionosphere** (Bibl), 11.11–49.

11.11–67 550.38:662.2:539.1

Berthold, W. K.; Harris, A. K. and Hope, H. J. (*all, Fort Monmouth, N. J.*), **World-wide effects of hydromagnetic waves due to Argus.** *Journal of Geophysical Research*, Wash., D. C., 65(8):2233–2239, Aug. **1960.** 10 figs., 2 tables, 11 refs. **DLC**—The Argus detonations in the ionosphere above the south Atlantic produced geomagnetic disturbances that propagated to almost all parts of the world. The geomagnetic variations, having a quasi-period of 1 to 3 sec, were recorded principally by induction-type magnetometers and earth-current stations. We found two signals whose indicated velocities were of the order of 3000 and 700 km/sec. Amplitudes varied from 5 gammas (Antarctica) down to 0.002 gamma at our large loop in Arizona. The signal strength falls off rapidly as the direction of propagation deviates from the geomagnetic meridian. *Subject Headings:* **1. Nuclear explosion effects on geomagnetism 2. High altitude nuclear explosions.**—*Authors' abstract.* Ⓢ

11.11–68 550.38(4)

Bock, R., **European field of the normal geomagnetic vertical intensity and its secular variation.** *Geophysical Prospecting*, 7(4):389–413, **1959.** 14+6 figs., 9 tables, ref., eqs. English and German summaries. **DLC**—A uniform field of the normal geomagnetic vertical intensity and its normal dependence on the first and second powers of latitude and longitude are derived for Europe and represented by sketches. The epochs of 1938.5, 1941.5, 1944.5, 1947.5, 1950.5, 1953.5 and 1956.5 have been chosen. It is suggested that anomalies of the vertical intensity should be given according to this field in order to obtain eventually a coherent image of the magnetic effects of the European continent. *Subject Headings:* **1. Geomagnetic field intensities 2. Secular geomagnetic variations.**—*Author's abstract.* Ⓢ

11.11–69 550.38

De Vuyst, A. (*Royal Meteorological Inst., Belgium*), **Sur les connaissances actuelles du géomagnétisme.** [The present knowledge in geomagnetism.] *Ciel et Terre*, Brussels, 76(1/2): 1–20, Jan./Feb. **1960.** 10 figs., 3 tables. **DWB, DLC**—Excellent and very comprehensive synthesis of the present knowledges in geomagnetism. Historical account, total magnetic field, residual field, secular variation, paleomagnetism, possible causes of the magnetic field, and electric currents are the principal subjects covered. The geomagneticians arrived at the conclusion that the Earth is magnetized in two different ways. It possesses a primary magnetism in connection with the earth's rotation, and a secondary magnetism superposed on the primary force. The surface distribution of geomagnetism varies in a very intricate manner, showing the influence of terrestrial relief. From this results the secular variation of the elements with such rapidity that the magnetic poles undergo important geographical displacements. Paleomagnetism proves moreover that at three geological ages the earth's magnetic field has been reversed. Finally, the earth's magnetic momentum is not constant; it undergoes at the present time a 5% lessening per century. It is almost certain that the geomagnetic field is due to electric currents produced by convection currents within the earth's core. The theories are based on ideas following which the earth's magnetic field should be generated and maintained by an induction system: the magnetic energy is derived from the kinetic energy of the fluid's movement in the core. In any case, whatever the mechanism at the origin may be, it is beyond doubt that this mechanism has a close connection with the rotation of our planet. Since the earth's magnetic poles have wandered in the course of geological times, one may deduce that the earth's axis of rotation has also changed. In other words: the earth has rolled about its axis and has modified the position of its geographic poles. If the hypothesis of "wandering poles" could be verified, the fact that in remote geological periods glaciers were to be found in the vicinity of the present-day equator would be explained. *Subject Headings:* **1. Geomagnetism 2. History of geomagnetism 3. Geomagnetic research 4. Geomagnetic field origin.**—*A. V.* Ⓢ

11.11–70 538.56:535.32

Getmantsev, G. G. and Rapoport, V. O., **O narastanii elektromagnitnykh voln v plazme, dvizhushcheĭsia v dielektrike bez dispersii, pri nalichii postoiannogo magnitnogo polia.** [Build-up of electromagnetic waves in a plasma moving in a nondispersive medium in the presence of a constant magnetic field.] *Zhurnal Eksperimental'noĭ Teoreticheskoĭ Fiziki*, Moscow, 38(4)L1205–1211, **1960.** 5 footnotes, 6 refs., 18 eqs. Russian summary p. 1205; English summary p. 1211. **DWB, DLC.** Transl. into English available in corresponding issue of *Soviet Physics JETP*, N. Y.—A dispersion equation has been obtained which describes the propagation of plane electromagnetic waves in a plasma beam moving in a fixed plasma along the lines of force of a constant and homogeneous magnetic field. The damping (or build-up) coefficients of the waves as a function of time have been found for a rarefied plasma moving along the magnetic field through a nondispersive dielectric. *Subject Headings:* **1. Electromagnetic wave propagation 2. Dispersion equations.**—*E.Z.S.* Ⓢ

11.11–71 550.386.6

Indices of geomagnetic activity of the observatories at Hartland (Ha), Eskdalemuir (Es), Lerwick (Le) July to September 1958. *Journal of Atmospheric and Terrestrial Physics*, London, 13(3/4):385–387, Feb. **1959. DWB**—The tables presented contain figures representing the *K*-indices for three-hour intervals for July to Sept. 1958. *Subject Headings:* **1. Geomagnetic activity 2. K-index.**—*O.T.* Ⓢ

11.11–72 550.385.37:550.375(47)

Kalashnikov, A. G., **Nabliudenie bystrykh pul'satsiĭ geomagnitnogo polia i zemnykh tokov.** [Observations on rapid pulsations of the geomagnetic field and earth currents.] *Priroda*, Moscow, No. 4:59–62, April **1959.** 4 figs. **DLC**—In the U.S.S.R. observations of micropulsations of the geomagnetic field and of earth currents were carried out during the IGY at 5 specially organized stations equipped with flux measuring instruments developed by the Institute of Earth's Physics of the U.S.S.R. Academy of Sciences which is in charge of these operations. The author describes and explains in detail the working principles and operation of these fluxmetric stations and accompanies his explanations by a laudatory note of CHAPMAN (England) who visited the station of Borka with a group of foreign scientists. *Subject Headings:* **1. Geomagnetic micropulsations 2. Earth currents 3. Soviet participation in IGY.**—*A.M.P.* Ⓢ

11.11–73 550.382.3:551.241 550.384:551.555.1

Opdyke, N. D. and Runcorn, S. K., **Palaeomagnetism and ancient wind directions.** *Endeavour*, London, 18(69):26–34, Jan. **1959.** 14 figs. (incl. color photos), 11 refs. **DLC**—The study of the direction of magnetization of rocks shows that the continents have changed their distances from and their orientation relative to the geographical pole. It is very desirable to confirm the positions revealed by this work. One method is to use the record of the directions of the trade-winds of ancient geological times as preserved in aeolian sandstones. The methods used in both of these approaches and the extent to which they confirm one another, are discussed with reference to both hemispheres in this article. *Subject Headings:* **1. Paleomagnetism 2. Trade wind direction in geological periods 3. Magnetization of rocks.**—*Authors' abstract.*

11.11–74 550.37:622

Tikhnov, M. N.; Shakhsuvarov, D. N. and Rybakova, E. V., **Ob osobennostiakhelektromagnitnogo polia dipolia, vozbuzhdaemogo v sloe, lezhashchem na izoliatore.** [Peculiarities of the electromagnetic dipole field generated in a layer above an insulator.] *Akademiia Nauk SSSR, Ser. Geofiz.*, No. 11:1670–1672, Nov. **1959.** 4 figs., 2 refs., 12 eqs. **DLC**—The vertical component (Bz) of the magnetic field, exited by the electric dipole in the uniform layer above an insulator, is investigated with the amplitudes and phases curves. These curves were obtained for interpretation of the field data obtained at the electromagnetic sounding by the dipole installation. The maximum value of the curves depends upon the ratio of distance between input and output electrodes to the thickness of the layer. Four sets of curves are

discussed in the text and analyzed in respect to indication of asymptotic and maximum values. *Subject Headings:* **1. Dipole fields 2. Geoelectric sounding techniques.**—*N.P.S.*

11.11–75 550.38:551.510.62:621.396:551.11

Wait, James R. and Spies, Kenneth (*both, Natl. Bur. of Standards, Boulder, Colo.*), **Influence of earth curvature and the terrestrial magnetic field on VLF propagation.** *Journal of Geophysical Research*, Wash., D. C., 65(8):2325–2331, Aug. **1960.** 5 figs., 9 refs., 20 eqs. **DLC**—An account is given of some recent work on the mode theory of VLF ionospheric propagation. Attention is confined to the behavior of the attenuation coefficient of the dominant mode. The ionosphere is assumed to be a sharply bounded and homogeneous ionized medium. It is indicated that earth curvature increases the attenuation rate by as much as a factor of 2 as compared with the corresponding attenuation for a flat earth. The influence of the earth's magnetic field is also shown to be important. In fact, east-to-west propagation paths suffer much greater attenuation than west-to-east paths. The theoretical results in the present paper appear to agree well with the experimental data of W. L. Taylor. *Subject Headings:* **1. Geomagnetic effects on radio wave propagation 2. Radio wave attenuation 3. Earth's shape.**—*Authors' abstract.* Ⓢ

11.11–76 535.23:536.7:531.6

Ward, Frederick W., Jr. (*GRD, AF Camb. Res. Ctr., Mass.*), **The variance (power) spectra of C_i, K_p, and A_p.** *Journal of Geophysical Research*, Wash., D. C., 65(8):2359–2373, Aug. **1960.** 9 figs., 16 refs., eqs. **DLC**—Time series of geomagnetic disturbance indices C_i, K_p, and A_p are subjected to variance (power) spectrum analysis. Application of this technique yields the distribution of the statistical variance of a time series as a function of the frequency or period of the variations. Furthermore, its use overcomes certain theoretical and computational difficulties inherent in standard Fourier analysis. The spectra of the three indices are identical in almost all respects. They demonstrate the mathematical existence of the 6-month period, and periods of 27, 14, 9, 7, $5\frac{1}{2}$, and $4\frac{1}{2}$ (27/N, N = 1,2,3,4, and 6) days. No interpretation of the overtones of the 27-day period is given. The spectra show that, over intervals of some months, there are considerable changes in the distribution of the variance among these periods. However, there are few systematic differences in the spectra between times of sunspot maxima and minima. *Subject Headings:* **1. Power spectra 2. Geomagnetic disturbances.**—*Author's abstract.* Ⓢ

5. VAN ALLEN BELT AND NOCTILUCENT CLOUDS

See also: **Noctilucent clouds, 11.11–2.**

11.11–77 551.521.64:551.507.362.2

Bilancini, R., **Le zone di Van Allen.** [The Van Allen belt.] *Rivista di Meteorologia Aeronautica*, Rome, 19(4):49–50, Oct./Dec. **1959.** fig. **DLC**—The author describes the Van Allen belt which was discovered with the aid of Explorer I and III. The region consists of two superposed zones of intense radiation that surround the earth at the highest altitudes corresponding to equatorial and temperate latitudes. A diagram of the Van Allen belt as given by Geiger counter recordings is presented. The radiation is constituted of electrons and protons decelerated by the terrestrial magnetic field. In the inner belt electrons prevail and in the outer belt, protons of very high energy. This suggests that the two belts are of different origin; the outer belt could be produced by solar plasma while the inner belt could be from the products of decay due to the albedo relative to cosmic rays. Another explanation of the existence of two belts is the supposed selective diffusion in a radial direction of the radiation imprisoned in the center of a nonhomogeneous terrestrial magnetic field of the earth. *Subject Headings:* **1. Van Allen belts 2. Satellite observation of Van Allen belts.**—*I.L.D.* Ⓢ

11.11–78 551.593.653:551.506.22(473):778.38

Burov, M. I., **Fotogrammetricheskiĭ metod opredeleniia vysot serebristykh oblakov.** [Photogrammetric method of determining the height of noctilucent clouds.] (In: Eesti NSV Teaduste Akadeemia Füüsika ja Astronoomia Instituut, **Trudy Soveshchaniia po Serebristym**

Oblakam, Tartu, 1958. Issued Tartu, **1959.** p. 92–111. 4 figs., table, 13 refs., eqs. French summary p. 111.) **DWB** (M93.653 A313tr)—Earlier investigations of the height of noctilucent clouds, both in the U.S.S.R. and abroad, are cited. A detailed exposition is then given of the mathematical basis for height determination by the photogrammetric method. The results of actual observations made near Moscow on the night of June 16–17, 1958 are presented. A mean height of 82.6 km was obtained, which agrees well with mean height values reported by JESSE and STÖRMER. The article concludes with an evaluation of the observational error involved. *Subject Headings:* **1. Noctilucent cloud height photogrammetry 2. IGY noctilucent cloud program 3. Moscow, U.S.S.R.**—*R. S. Quiroz.* Ⓢ

11.11–79 551.593.653:551.506.22(473.3)

*Dirikis, M., **Itogi Rizhskogo otdeleniia VAGO po nabliudeniiu serebristykh oblakov v 1958 godu.** [Results of noctilucent cloud observations by the Riga branch of the All-Union Astronomical-Geodetic Society in 1958.] (In: Eesti NSV Teasuste Akadeemia Füüsika ja Astronoomia Instituut, **Trudy Soveshchaniia po Serebristym Oblakam, Tartu, 1958.** Issued Tartu, **1959.** p. 23–34. fig., photo, 4 tables, ref. German summary p. 33–34.) **DWB** (M93.653 A313tr)—Four stations in Latvia have regularly made observations of noctilucent clouds (visual and/or photographic); of these the station at Sigulda has a specially built platform for taking these observations. For noctilucent clouds observed during March–October 1958, complete data are given in a graph and tables showing dates and beginning and ending time of each occurrence and cloud coordinates, along with data on the state of the sky (general cloud cover) and (negative) altitude of the sun. A statistical relationship between season of the year and time of day of occurrence of noctilucent clouds is indicated by the observations. *Subject Headings:* **1. Noctilucent cloud observations 2. IGY noctilucent cloud program 3. Riga, Latvian S.S.R.**—*R. S. Quiroz.* Ⓢ

11.11–80 551.593.653:551.506.22:061.3(47)

*†Eesti NSV Teaduste Akadeemia. Füüsika ja Astronoomia Instituut, **Trudy Soveshchaniia po Serebristym Oblakam, Tartu, 12–14 Dekabria 1958g.** [Transactions of the Conference on Noctilucent Clouds, Tartu, Dec. 12–14, 1958.] Issued Tartu, **1959.** 127 p. figs., tables, refs., eqs. English summaries for each article. Table of contents in Russian and English. At head of t-p.: Akademiia Nauk Estonskoi SSR, Institut Fiziki i Astronomii. (For listing of contents, *see* Pt. III, p. 471, March 1960, *Met. Abstracts.* All articles abstracted separately.) **DWB** (M93.653 A313tr)—At the conference on noctilucent clouds held in Tartu, Esthonia, Dec. 12–14, 1958, 45 specialists from various parts of the U.S.S.R. discussed scientific results and observational problems connected with the comprehensive observation program organized for IGY in the U.S.S.R., and drew up a resolution consisting of 11 recommendations concerning continuation and extension of 1957–8 work in 1959. The transactions of the conference at Tartu; a report on the symposium held in Moscow on Aug. 8, 1958 at the 5th meeting of CSAGI; results of observations of noctilucent clouds at Riga, Tartu, Tallinn, Gorki, in the Urals; problems of organizing a noctilucent cloud observation network; a photographic method for determining the height of noctilucent clouds and, finally, a plan for the 1959 observational program are included in the publication. Authors include V. SHARONOV, N. GRISHIN, I. KHVOSTIKOV and others. The volume is full of photographs, charts, graphs and data tables resulting from the organized observational program of IGY. It is noted that Tartu, where the conference was held, has a long history of noctilucent cloud observations, dating back to 1885 when E. HARTWIG described 11 separate cases of noctilucent clouds in June, July and August. *Subject Headings:* **1. Noctilucent cloud conferences 2. Noctilucent cloud observation techniques 3. IGY noctilucent cloud program 4. Tartu, Esthonian S.S.R. 5. U.S.S.R.**—*M.R.* Ⓢ

11.11–81 551.593.653:551.506.22:535.24(47)

Sharonov, V. V., **Problemy i metody absoliutnoĭ fotometrii serebristykh oblakov.** [Problems and methods of absolute photometry of noctilucent clouds.] *Akademiia Nauk SSSR. Mezhduvedomstvennyĭ Komitet po Provedeniiu MGG, Nekotorye problemy meteorologii,* No. 1:124–139, **1960.** 2 figs., table, 18 refs., 21 eqs. English summary p. 140. **DWB** (M(055) N418ne)—The main task of photometric observations of noctilucent clouds, organized during

IGY in the U.S.S.R., is to obtain a scattering diagram showing the dependence of intensity of scattering on the angle of scattering ϑ for cloud particles. For this purpose the apparent brightness of B' cloud is measured simultaneously from different stations located along ϑ one and the same line (Fig. 1). The use of methods of absolute photometry makes it possible to express the results in one and the same system. Brightness B_0 of an absolute white screen located in the cloud zone normally to sun rays is taken for the unit. This gives the albedo A of the cloud:

$$A = \frac{B}{B_0} = \frac{\pi B}{E_0}$$

where B is the true brightness of the cloud and E_0 is the solar illumination on a normal to sun rays plane. Methods of transition from apparent brightness of B' cloud to the true brightness B (that demands the exclusion of diffuse light from the twilight sky and atmospherical extinction) are discussed. Described is the technique of absolute visual and photographic photometry which is a comparison of B' cloud brightness with the brightness B_s of a standard photometric screen located in a point of observation and illuminated by direct sun rays. *Subject Headings:* **1. Noctilucent clouds 2. Photometric observation techniques 3. IGY noctilucent cloud program 4. U.S.S.R.**—*Author's abstract.* Ⓢ

11.11–82 551.593.653:551.506.22(234.8)

Skul'skiĭ, V. Iu., **Nabliudeniia za serebristymi oblakami na Urale v period Mezhdunarodnogo geofizicheskogo goda.** [Observations of noctilucent clouds in the Urals during the International Geophysical Year.] (In: Eesti NSV Teasuste Akadeemia Füüsika ja Astronoomia Instituut, **Trudy Soveshchaniia po Serebristym Oblakam Tartu, 1958.** Issued Tartu, **1959.** p. 56–67. 6 figs., 3 photos, 2 tables, 2 refs. German summary p. 67.) **DWB** (M93.653 A313tr)—Systematic photographic observations of noctilucent clouds were made during the IGY at six stations in the region of the Urals between 47° and 61°N. lat. A station location map is included, along with some provisional results worked up by the Urals State University. Times and dates of noctilucent clouds observed during 1958 are given for each of the sites, as well as detailed cloud data from observations of the twilight sky. *Subject Headings:* **1. Noctilucent cloud observations 2. IGY noctilucent cloud program 3. Ural Mountains.**—*R. S. Quiroz.* Ⓢ

6. ASTRONAUTICS—SATELLITES

See also: **Satellite measurement of meteoritic dust** (Dubin), 11.11–39; **Satellite ionospheric electron density measurement** (Little, Lawrence), 11.11–54; **Satellite obs. of Van Allen belts** (Bilancini), 11.11–77.

11.11–83 551.507.362.2:551.594.51:551.521.64

Lequeux, James, **Ce que les satellites artificiels ont déjà appris sur les rayons cosmiques et les particules aurorales.** [What the artificial satellites already have taught about cosmic rays and auroral particles.] *La Nature*, Paris, No. 3300:146–154, April **1960.** 14 figs. **DLC**—The effects of the earth's magnetic field and of the atmosphere on the paths of cosmic rays and the process of particle convergence towards the polar regions are clearly set out. The rockets and artificial satellites have brought a very important contribution; they permit checking the presence in the polar auroras of a considerable number of electrons, ionizing within the upper atmosphere the molecules and atoms whose recombination provokes the luminous phenomena of auroras. The observational possibilities of satellites, the characteristics and properties of the instruments they carry along are described. Explorer IV and Sputnik III yielded informations beyond the boundaries of the earth's magnetic field's influence. The Soviet rocket gives in these regions a total flux of 2.3 ± 0.1 particles per cm²/sec and Explorer IV gives 1.8 ± 0.3 particles/cm²/sec. After having recounted the discovery of the two corpuscular radiation belts, the author gives some informations on how the low energy charged particles can be trapped in the earth's magnetic field. In particular, he describes the movement of an electron within a magnetic field and shows the trajectories of particles in the Van Allen belts in the terrestrial field. The statement of the theories which attempt at explaining the existence of Van Allen's belts led the author to deal with the origin of the particles of the

equatorial belt and with the origin of the auroral particles. The geophysical importance of the two Van Allen belts is considerable. The auroral belt may be considered as an intermediate reservoir of particles between the sun and the upper atmosphere. The role of these particles in the formation of auroras is ascertained and it seems that a relationship exists between the charged particles of the two radiation belts and the geomagnetic disturbances, particularly the magnetic storms with a sudden commencement. *Subject Headings:* **1. Satellites 2. Van Allen belts 3. Cosmic ray research 4. Auroral particles 5. Geomagnetic effects on cosmic rays.**—*A. V.* Ⓢ

11.11–84 551.506.7:551.507.362.1:533.6

Liu, V. C. (*Dept. of Aeronautical and Astronautical Engr., Univ. of Mich., Ann Arbor*), **Rarefied-gas dynamical considerations in the rocket-sounding measurements.** *Rand Corporation, Santa Monica,* [*Publication*] R-339, **1959.** Paper No. 7 (8 p.). 3 figs., 11 refs. **DWB** (M10.5 R186ae)—Aerodynamic methods of measuring upper atmospheric properties by means of sounding rockets are discussed from the rarefied-gas dynamical point of view. On the basis of this discussion, it is proposed that combinations of different aerodynamic methods on the same sounding rocket can and should be designed to acquire additional physical insight into the aerodynamics of rarefied media. *Subject Headings:* **1. Rocket soundings 2. Aerodynamics 3. Upper air sounding techniques.**—*Author's abstract.* Ⓢ

11.11–85 551.507.362.2:551.576.1:778.3

Fritz, S. and Wexler, H. (*both, U. S. W. B., Wash., D. C.*), **Cloud pictures from satellite TIROS I.** *Monthly Weather Review,* Wash., D. C., 88(3):79–87, March **1960.** 10 figs., 2 refs. **DWB, DLC**—Some of the more striking examples of cloud phenomena revealed by the first pictures that have come from the experimental weather satellite, TIROS I, are presented, and broad-scale patterns in the pictures are interpreted in terms of general features of the associated weather maps. These preliminary results show that a vast variety of scales appear in the cloud patterns associated with cyclonic vortices. Marked differences, as well as similarities, in cloud patterns associated with several types of cyclones are pointed out; the cyclones discussed include mature vortices in the Atlantic and Pacific Oceans, younger cyclones over and near the United States, and a typhoon in the South Pacific Ocean. The cloud cover over an extensive area is portrayed by means of preliminary mosaics of TIROS pictures and by a schematic cloud map made from the pictures. *Subject Headings:* **1. Cloud photographs 2. Satellite photography 3. U. S. satellite, 1960 Beta 2 (Tiros I).**—*Authors' abstract.* Ⓢ

11.11–86 629.19 613.693

Ackeret, Jakob, **Raumfahrt.** [Travelling into space.] *Naturforschende Gesellschaft in Zurich, Vierteljahresschrift,* 104, Abhandlung, No. 4, Dec. 31, **1959.** 46 p. 19 figs., 9 refs. **DLC**—Interplanetary travelling or change of place in planetary space, once a dream is becoming a reality. The author explains clearly the utilization of the rocket principle and the principle of the stages system. Information is given about chemical propulsion: the different acceleration systems. A third part treats of the celestial mechanism and the KEPLER laws. The fourth part considers interplanetary travel-launching, piloting and landing. The article ends by showing the interest in the scientific value of interplanetary traveling: information on origin of planetary system, cosmology and origin of life and consideration of the importance of information on atmospheric pressure, air temperature, winds, exact form of earth, cosmic radiation, meteorites, magnetic field, verification of general relativity theory and behavior of living creatures in space. The author hopes this modern means of scientific research will not be diverted from its real purpose. *Subject Headings:* **1. Astronautics 2. Interplanetary conditions 3. Geophysical research.**—*A. V.* Ⓢ

11.11–87 629.19:523.4

Haley, Andrew G. (*Pres., Int. Astronautical Federation*), **Astronautics and space exploration.** [Testimony of A. G. Haley in hearings before the Select Committee on Astronautics and Space Exploration, 85th Congress, 2nd Session, on H. R. 11881, May 8, 1958. Washington, D. C., **1958.**] p. 1431–1447. 2 figs. **Publications by A. G. Haley,** p. 1444–1445. –An account of hearings given before the Select Committee on Astronautics, JOHN W. MCCORMACK

presiding. Others who attended include Representatives KEATING, FULTON, NATCHER, MCDONOUGH, FORD, BROOKS, HAYS, O'BRIEN, METCALF and SISK. The first witness before the committee was ANDREW HALEY, president of the International Astronautical Federation. In his testimony he favored an international agreement about outer space. A list is given of different organizations in the various countries of the world which are members of the International Astronautical Federation. *Subject Headings:* **1. Astronautics 2. Interplanetary flights. I. Congress. House. Select Committee on Astronautics and Space Exploration.** —*A.H.K.*

11.11–88 551.507.362.2:629.19(09)

Muller, P., **Au-delà des satellites pionniers et luniks.** [Beyond Pioneer and Lunik satellites.] *L'Astronomie*, Paris, 74(1):1–7, Jan. **1960** and 74(2):49–56, Feb. **1960.** 3 figs., plate. **DLC, NNC, DWB**—History of satellite launchings, classified by the author in four main groups: Sputniks, Vanguards, Explorers (which led to discovery of the Van Allen belts) and Discoverers. Review of the increasingly successful attempts made in the Moon's direction. The author mentions and develops three different aims peculiarized by the manner of arrival of the projectile: target hit, passage at distance with ulterior evasion, passage at proximity followed by skirting as close by as possible. The author gives the different characteristics of Pioneers I, III and IV and of Luniks I, II and III and the results that they have yielded. The last part deals with considerations on planetary shooting. *Subject Headings:* **1. Satellite research 2. Satellite launching history.**—*A.V.* Ⓢ

11.11–89 629.19:523.7

Schatzman, E., **Les applications de l'astronautique à l'astrophysique.** [The applications of astronautics in astrophysics.] *Astronautica Acta*, Vienna, 6(2/3):159–166, **1960.** 2 figs., 2 tables, 6 refs., eqs. English, German and French summaries p. 159. **DWB**—Problems in astrophysics, astronomy and cosmogony are listed for whose solutions astronautics will play an important role. *Subject Headings:* **1. Astronautics 2. Astrophysics.**—*Author's abstract.* Ⓢ

11.11–90 533.5:533.6.013:551.507.362.2

Hurlbut, F. C. (*Univ. of Calif. and Rand Corp.*), **Notes on surface interaction and satellite drag.** *Rand Corporation, Santa Monica,* [*Publication*], R-339, **1959.** Paper No. 21 (25 p.). 2 figs., table, 34 plus 8 refs., 8 eqs. **DWB** (M10.5 R186ae)—Under conditions of fully developed free molecular flow the interaction between a body and the upper atmosphere is entirely dependent on the summation of the effects of the individual particle-surface interactions, each one occurring independently of the other. The present state of our knowledge of these interactions is discussed and the assumptions employed in current free-molecule aerodynamic calculation are examined. It is concluded that for the present the tangential momentum transfer coefficient may safely be taken to be unity, but that the coefficient for energy transfer may have values in the range 0.3 to 0.7 for atmospheric gases on metallic surfaces rather than the commonly assumed value of unity. The relation of energy transfer to the transfer of normal momentum is indicated. *Subject Headings:* **1. Drag coefficients 2. Satellite drag 3. Molecular flow.**—*Author's abstract.* Ⓢ

11.11–91 533.5:533.6.013:551.507.362.2

Schamberg, R. (*Rand Corp.*), **Analytic representation of surface interaction for free molecule flow with application to drag of various bodies.** *Rand Corporation, Santa Monica,* [*Publication*], R-339, **1959.** Paper No. 12 (41 p.). 12 figs., 2 tables, 11 refs., 30 eqs. **DWB** (M10.5 R186ae)—The customary analytic representation of the gross effects of the interaction between gas molecules and a solid surface is re-examined and found to be unsatisfactory. An alternative model for surface interaction is proposed, and is used to calculate force coefficients of flat plate and convex bodies in "hyperthermal" free molecule flow—the case for which the random thermal motion of the molecules is negligible relative to the speed of the body through the rarefied gas. These results are later extended to lower flight speeds by use of a simple gas model due to JOULE. Formulas are given for the drag coefficients of spherical, cylindrical, and conical satellites which may be attitude stabilized, tumbling in a random manner, or tumbling about a specified axis. These formulas are then used to estimate the effects of

tumbling motion and uncertainty in the surface interaction on the drag of satellites. *Subject Headings:* **1. Drag coefficients 2. Satellite drag 3. Molecular flow.**—*Author's abstract.* Ⓢ

11.11–92 533.5:533.6.013:551.507.362.2

†Willis, D. Roger (*Res. Engr., Aerosciences Lab., G. E. Co., Missile and Space Vehicle Dept., Philadelphia*), **Study of near free molecule flow.** *Rand Corporation, Santa Monica, [Publication]*, R-339, **1959.** Paper No. 13 (32 p.). 5 figs., 20 refs., numerous eqs. **DWB** (M10.5 R186ae)—When a satellite or other space vehicle descends below a certain altitude, some intermolecular collisions must be considered. Various methods suggested for the analysis of such nearly free molecular flow problems are discussed. A formal iterative method of solving Boltzmann's equation for the distribution function is presented. It is shown that the first collision methods represent an approximation to the calculation of the first iterate in the proposed method, when the zeroth iterate is taken as the free molecular solution. The assumption in the first collision method that collisions between two molecules, both of which come from the body, can be neglected appears to require further analysis before being accepted. The choice of the intermolecular collision mechanism appears to play a hither-to unsuspectedly large role in determining the final corrections to free molecular results, particularly for a cold body in a high speed ratio stream. *Subject Headings:* **1. Satellite re-entry 2. Satellite drag 3. Molecular flow.**—*Author's abstract.* Ⓢ

11.11–93 551.507.362.2:551.510.3

Kerfoot, H. Potter (*Aero-Space Lab., North American Aviation, Inc., Missile Div., Downey, Calif.*), **Influence of aerodynamic drag on satellite orbits.** *Rand Corporation, Santa Monica, [Publication]*, R-339, **1959.** Paper No. 5 (19 p.). 3 figs., 6 refs., numerous eqs. **DWB** (M10.5 R186ae)—An analysis is made of the orbital behavior of a satellite subjected to aerodynamic drag, using a static, exponential-density atmosphere. It is found that the period versus eccentricity history of such a satellite is determined solely by its initial orbit. Thus, two very different satellites launched in the same initial orbit will follow identical period-versus-eccentricity histories, although the vehicle with greater drag will descend through this history in a shorter time. The period versus time history is shown to obey a simple power law: the difference in period from a reference value being proportional to the 0.485 power of the time to reach the reference period. Confirming data are presented from satellites 1957 Beta and 1958 Zeta. *Subject Headings:* **1. Satellite orbits 2. Satellite drag.**—*Author's abstract.* Ⓢ

11.11–94 551.507.362.1

Long, R. S., **Transfer between non-coplanar elliptical orbits.** *Astronautica Acta*, Vienna, 6(2/3):167–178, **1960.** 2 figs., 3 refs., 122 eqs. English, German and French summaries p. 167. **DWB**—The problem of two-impulse transfer of a rocket with minimum expenditure of propellant between non-coplanar elliptical orbits is considered. On the assumption that the eccentricities of the given orbits are small, a solution is obtained to the first order. A method is also indicated for obtaining a first order solution when the angle between the planes of the given orbits is small and the eccentricities are fixed. *Subject Heading:* **1. Rocket transfer.**—*Author's abstract.* Ⓢ

11.11–95 551.510.3/4 / 629.19 613.693

Der Mensch im Weltraum. [Man into space.] *Schweizer Aero-Revue*, Zurich, 35(5): 299–301, May **1960. DLC**—The idea that one day it will be possible for man to reach the Moon or Venus or Mars, may be considered a technical reality today. The article mentions the experiences of Robert T. Clark in collaboration with Alberto Hurtado and Tulio Velasquez at Lima (Peru) on the problem of the adaptation of men in an atmosphere poor in oxygen and on the time necessary for this adaptation. The author presents many problems that must be resolved before a man could go into space: 1) Terrestrial atmosphere gives the oxygen necessary for respiration but utilization of oxygen for respiration ends at 17–18 km altitude 2) At altitude 1727 km, the atmospheric pressure reaches only a 720th part of the pressure at sea level, at this altitude there is not enough air for counter-balancing the pressure in the cabin; 3) In low layers of the atmosphere, man is protected against important cosmic radiation of the exosphere by a filtering action but at 40 km altitude, this action is stopped; 4) In layers

above 40–46 km, biological action of U.V. is preponderant; 5) Protecting action of the atmosphere against meteorites disappears at 40 and 120 km altitude; 6) In interplanetary space, the human eyesight in quite different; 7) The sense of hearing is also influenced, an absolute silent zone exists at a 160 km altitude; 8) Gravity has disappeared between 190 and 225 km. The author considers also the psychological influences and ends with the conclusion that the realization of interplanetary flights is posing more medical problems than technical ones. *Subject Headings:* **1. Atmospheric composition 2. Air density 3. Astronautics 4. Interplanetary conditions 5. Space medicine.**—*A. V.* Ⓢ

11.11–96 551.507.362.2:551.521.1

Parkinson, R. W. (*Ramo-Woolridge Div., Los Angeles*); Jones, H. M. and Shapiro, I. I. (*both, M. I. T., Lexington*), **Effects of solar radiation pressure on earth satellite orbits.** *Science*, Wash., D. C., 131(3404):920–921, March 25, **1960.** fig., 2 refs., 2 eqs. **DLC**—Calculations show that, at a mean altitude of 1000 mi, radiation pressure can displace the orbit of the 100-ft Echo balloon at rates up to 3.7 mi per day, the orbit of the 12-ft Beacon satellite at 0.7 mi per day. For certain resonant conditions this effect accumulates, drastically affecting the satellite's lifetime. *Subject Headings:* **1. Satellite orbits 2. Solar radiation effects on satellites.** —*Authors' abstract.* Ⓢ

11.11–97 551.501.7:535.8:551.507.362.2

Todd, Edward P. (*Upper Air Lab., Univ. of Colo.*), **Specular reflection from a spherical surface.** *Optical Society of America, Journal*, 49(5):491, May **1959.** fig., ref., 5 eqs. **DWB, DLC**—T. Tousey gave a simple derivation of the luminous intensity of a spherical, specularly reflecting satellite which applies to the case where the point of observation is at a great distance from the satellite. The present paper suggests that the derivation may be easily extended to include the case where the point of observation is close to the spherical surface. The problem is mathematically treated, and geometric construction for specular reflection from a sphere is graphically presented. *Subject Heading:* **1. Satellite optical observation techniques.**—*I.S.* Ⓢ

11.11–98 621.455

Jacobs, T. A.; Penner, S. S.; Gill, G. et al., **Approximate theoretical performance evaluation for a diverging rocket.** *Astronautica Acta*, Vienna, 6(2/3):151–158, **1960.** 4 figs., 6 refs., numerous eqs. English, German and French summaries p. 151. **DWB**—A simplified combustion model, which is motivated by available performance studies on the diverging rocket reactor, has been used as basis for an engine performance evaluation. Comparison with conventional rocket configurations shows that an upper performance limit for the diverging reactor is comparable with performance estimates for engines using an adiabatic work cycle. Development of the diverging reactor for engine applications may, however, offer some advantages for very hot, high-energy, propellant systems. *Subject Heading:* **1. Rocket propulsion. I. Eckel, E. F.**—*Authors' abstract.* Ⓢ

11.11–99 551.507.362.1

Reismann, H. and Pistiner, J. S., **Design and evaluation of a re-entry guidance system.** *Astronautica Acta*, Vienna, 6(2/3):79–114, **1960.** 47 figs., table, 17 refs., 39 eqs. English, German and French summaries p. 79. **DWB**—One of the critical problems that must be solved when dealing with manned re-entry is safe recovery of the vehicle and its occupant(s) near a predetermined point on the earth's surface. This paper presents the design and analysis of a fully automatic re-entry guidance system that will permit safe recovery of the vehicle within 0.02 naut mi (1σ) of a preselected point on the earth's surface (neglecting winds and terminal dispersions due to parachute landing) for initial re-entry conditions achievable with existing equipments. *Subject Headings:* **1. Rocket instrumentation 2. Rocket re-entry.**— *Authors' abstract.* Ⓢ

11.11–100 551.507.362.2:523.3

Raimond, J. J., Jr., **De eerste tocht rond de maan.** [The first tour around the moon.] *Hemel en Dampkring*, The Hague, 58(3):57–71, March **1960.** 8 figs. **DWB, DLC**—An

article about Lunik III since Oct. 4, 1959, launched at Aral'sk near the Caspian Sea. A description of the rocket is given according to information collected by a collaborator of the Bendix Aircraft Corporation. Some information about calculation of the trajectory made by G. Gamow and K. A. Ehrike are given in a fig., the author mentions also the calculations made in Holland by J. M. J. Kooy in collaboration with J. Berghuis using the "Bull Nederland" computer. Lunik III started its trajectory over the Northern Hemisphere and continued its way to the moon in a trajectory situated in a plane perpendicular to the plane described by the moon trajectory. Two figs. giving the trajectory of Lunik III are described and explained clearly. *Subject Headings:* **1. Moon rockets 2. Satellite orbits 3. Soviet satellite, 1959 Theta (Lunik III).**—*A. V.* Ⓢ

11.11–101 551.507.362.1:523.3:531.112:681.4:621.38

Kooy, J. M. J. and Berghuis, J., **On the numerical computation of free trajectories of a lunar space vehicle.** *Astronautica Acta*, Vienna, 6(2/3):115–143, 1960. 19 figs. (incl. photos), 2 tables, 4 refs., 37 eqs. English, German and French summaries p. 115–116. **DWB**—With the occasional use of a "Bull Nederland" (Amsterdam) electronic computer, we have been able to carry out numerical investigations on trajectories of moon rockets. To begin with, a three dimensional orbit was worked out, in which the vehicle approaches the moon to within about 11,000 km, and so arriving at a position from which the hidden lunar hemisphere can be observed. Then, after completing a loop, the vehicle returns again to the vicinity of the earth. In this first example, the launching site was chosen on the equator, and during the last stage of the flight, a ballistic speed, just sufficient to bring the vehicle within lunar distance was applied. In a subsequent investigation, the launching site was chosen along a northern latitude (Cape Canaveral), and a hyperbolic speed was applied in the last burn out point. The effects of the application of a retro-rocket in the vicinity of the moon have also been explored. In this way, orbits planned to hit the moon, and also to circumnavigate the moon and return to earth, have been obtained. In all these cases, the lunar and solar disturbances have been taken into account. In addition, the possibility of launching a moon satellite has also been examined and a corresponding orbit has been computed. It appeared that the Kepler motion of such a moon satellite (with respect to a selenocentric system of reference, and not rotating with respect to the celestial sky) is strongly influenced by the combined terrestrial and solar disturbances. *Subject Headings:* **1. Moon rockets 2. Trajectory determination of supersonic bodies 3. Electronic computer applications.**—*Authors' abstract.* Ⓢ

E. OCEANOGRAPHY AND HYDROLOGY

1. OCEANOGRAPHY

See: **Oceanog., Indian Ocean** (Muromtsev), 11.11–10; **Ocean current obs.** (Chaplygin), 11.11–15; **Sea level forecasting** (Lebel, Gelcé), 11.11–122; **Oceanic circulation** (Fedorov), 11.11–141; **Gulf Stream effects on frontal passage** (Whiting), 11.11–167; **von Humboldt's work in oceanog.** (Model), 11.11–181; **Ocean-atmos. interaction, N. Pacific** (Namias), 11.11–192; **Sea temp. variations, N. Pacific** (Schulze), 11.11–193; **Sea surface temp., Sargasso Sea** (Worthington), 11.11–194; **Wind effects on silting in tideless seas** (Knars), 11.11–216.

2. GLACIOLOGY AND SEA ICE

See: **Ice shelf studies, Arctic** (Bushnell), 11.11–3; **Ice movement forecasting, Arctic** (Chaplygin), 11.11–15; **Radiation absorption by glaciers** (Ambach, Mocker), 11.11–106; **Ice conditions, Swedish coast** (Rodhe), 11.11–180; **Greenland ice temp.** (Loewe). 11.11–191.

3. HYDROLOGY

See: **Hydromet. Sec.**, p. 1835; **Heat exchange in reservoirs** (Nesina), 11.11–195.

METEOROLOGICAL OBSERVATIONS AND INSTRUMENTS

METHODS OF OBSERVATIONS

See also: **Radar echoes from auroras** (Flood), 11.11–64; **Radar echoes from auroras** (Gartlein et al.), 11.11–65; **Satellite optical obs. techniques** (Todd), 11.11–97; **Jet stream reconnaissance,** 11.11–145; **Valley wind observation, Vermont** (Davidson), 11.11–207; **Acoustical method of temp. measurement** (Mordukhovich), 11.11–280.

11.11–102 551.501.7

Levy, Bertram; Newstein, Herman and Schotland, R. M., **Sounding of the atmosphere by indirect means, Pt. 3.** N. Y. Univ. Research Div. College of Engineering. Dept. of Meteorology and Oceanography, Contract Cwb-9474, Final Report, Oct. **1959.** 57 p. figs., photos, refs., eqs. Contents: **Relationship between radiowave propagation and ground cover,** p. 1–25. **Measurement of the vertical distribution of water vapor by means of a light scattering technique,** p. 26–38. **Status report on the pulse ultraviolet ozone sounding system,** p. 39–57. **DWB** (M96.9 N532so)—The report consists of 3 separate parts. The first part considers the feasibility of determining ground properties from ground wave propagation characteristics. The analysis is divided into several sections. In the first section that component of the field which is commonly called the diffracted field is analyzed. In the subsequent sections this analysis is modified to account for varying earth properties. The analysis of the diffracted field shows that the ground wave analysis is not a feasible method for determining ground properties. The second part describes the measurement method of the vertical distribution of atmospheric gases by pulsed light techniques, presented in the final report written under Contract Cwb-9233, Dec. 1958. The third part is a status report on the pulse ultraviolet sounding system nicely illustrated by graphs and photoplates. *Subject Heading:* **1. Upper air sounding methods. I. Schotland, R. M.**—*I.S.*

11.11–103 551.501.724:551.524.31

Cehak, K., **Die Berechnung der Überschreitungsdauer einer Temperaturschwelle aus drei Terminbeobachtungen.** [Calculation of the duration of temperature exceeding a specified value, from three standard daily observations.] *Wetter und Leben*, Vienna, 10(3/4):57–66, **1958.** 3 figs., table, 10 eqs. **DLC**—A method for computing the length of time a given temperature within a particular interval continues to be above a particular threshold value when three fixed observations are available, is developed. The following assumptions are made: the element has a daily variation that can be approximated by a sine function with a period of 24 hrs; the observation of a particular hour have, within the given time to interval, a normal distribution and the time variations of scattering is so slight that from the standpoint of probability they can be considered as agreeing with the assumption of daily constant scattering. The probability that a threshold value X_0 of an element is exceeded can be regarded as the sum of the probabilities that the element assumes all values of X greater than X_0. The normal distribution, which is the best approximation of the sum, has a mean m and a dispersion s given by $m=\frac{1}{24}\Sigma m(t)$ and $s^2+m^2=\frac{1}{24}\Sigma[s^2(t)+m^2(t)]$. Approximations to these equations are derived since they presuppose knowledge of the daily variation of $M(t)$ and $s(t)$. Those are $m=m_0$ and $s^2=s_0^2+\frac{1}{2}(m_1^2+m_2^2)$

where $$m_0=\frac{m(7)+m(14)+m(21)}{3} \quad \text{and}$$

$$s_0=\frac{s(7)+s(14)+s(21)}{3} \quad \text{and}$$

$$m_1=0.622\Sigma z_i\cdot\sin 15i-0.150\Sigma z_i\cdot\cos 15i$$

$$m_2=0.795\Sigma z_i\cdot\cos 15i-0.150\Sigma z_i\cdot\sin 15i \quad \text{and}$$

$$i=7,\ 14,\ 21 \quad \text{and} \quad z_i=m(i)-m_0.$$

The application of this procedure is illustrated. A table giving the probability per thousand, that in a normal distribution $N(m,s)$ a threshold value will be exceeded is presented. *Subject Headings:* **1. Temperature calculations 2. Temperature variations.**—*I.L.D.*

11.11–104 551.501.777:551.508.77 · 551.578.46:551.578.41

Levi, Massimo (*Bureau Hydrographique, Magistrato Acque, Venice*), **Comme on mesure la neige en Italie.** [How snow is measured in Italy.] *International Union of Geodesy and Geophysics. Assoc. of Scientific Hydrology, Toronto, Sept.* 1957, [*Transactions*], Vol. 4, pub. **1958.** p. 136–148. 8 figs. (incl. photos). **DWB, DLC**—The methods of measurement and instruments used by the Italian network, which consists of 3550 pluviometric and 871 thermometric stations ranging in elevation from 250 m to over 2500 m are described, and sources of error are discussed. Snow cover depth is recorded with graduated stakes in wind-protected areas. Water equivalents are measured at representative locations with various snow balances. The snow balance of the Hydrographic Service (T.70) employs a cylinder 1–2 m long with a cutter 70 mm wide at one end and a steelyard-type balance. A new and improved type of snow balance (C.N 1), used at pilot stations at higher elevations, is similar except that it consists of 4 tubular duralumin sections, each 50 cm long, graduated in cm, and provided with a handle for driving the sampler into the snow, and 3 different types of serrated snow cutters for use with snow of varying degrees of compactness. Auxiliary equipment includes an Al snow stake consisting of 4 equal sections, and an Al shovel to aid in the collection of the samples. Each water-equivalent reading is recorded together with snow depth, temperatures of the air and snow surface, exposure and topography, wind velocity, and the state of the sky. Snow samples are also taken horizontally from each individual snow layer in a trench. *Subject Headings:* **1. Snow surveys 2. Water content of snow 3. Snow measurement techniques 4. Italy.**—*SIPRE abstract.*

11.11–105 551.501.9:551.515.23

Showalter, A. K. (*U. S. Weather Bureau*), **Ground station facilities for detecting, tracking, and predicting hurricanes.** *Technical Conference on Hurricanes, Miami Beach, Fla., Nov. 19–22, 1958, Proceedings*, issued **1958(?).** Section F5 (6 p.). **DWB** (M15.2 A512pr)—The geographical distribution of a modern hurricane network is plotted on maps to show type, location and equipment of the individual stations. These maps are reproduced on color slides and the four slides are described. *Subject Headings:* **1. Hurricane networks 2. Hurricane location.**—*W.N.*

OBSERVATIONAL DATA

See: **Met. data, Arctic** (Bushnell, *ed.*), 11.11–3; **Rocket soundings** (Liu), 11.11–84.

INSTRUMENT CARRIERS

See: **Sec. D6,** p. 1783; **Sunspot photographs from balloon-borne telescopes** (Raimond), 11.11–35; **Air-borne radio met. research** (Ament), 11.11–110.

INSTRUMENTS

See also: **Snow measurement techniques** (Levi), 11.11–104; **Radiation instruments** (La Toison), 11.11–169; **Radiosonde data** (Belogurov), 11.11–190; **Refractometers** (Rodney, Djurle), 11.11–270.

11.11–106 551.508.25:551.521.3:551.324.414

Ambach, W. and Mocker, H. (*both, Phys. Inst., Innsbruck Univ.*), **Messungen der Strahlungsextinktion mittels eines kugelförmigen Empfängers in der oberflächennahen Eisschicht eines Gletschers und im Altschnee.** [Measurements of radiation extinction by means of a spherical receiver in the surface layers of a glacier and in old snow.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. B*, Vienna, 10(1):84–99, **1959.** 8 figs., 3 tables, 13 refs., eqs. German, English and French summaries p. 84–86. **DWB, DLC**—A very small radiation receiver with spherical surface was constructed to render the shading effect of the instrument

a minimum and to keep the dimensions of the borehole small when the extinction coefficient in the surface layer of ice is determined. The receiver is a blackened hollow sphere (diameter 4 mm) reaching balancing within short time. Measurements show that the extinction coefficient of the glacier ice in the uppermost layer (2 to 3 cm depth) is about ten times greater than that in deeper layers (below 15 cm). Its maximum value at the surface amounts to 0.3/cm. It can be assumed for rough estimations that in the surface layer (0 to 15 cm) about 89% on the average of the incoming radiation pass through 1 cm ice and that 11% are absorbed. In deeper layers (below 15 cm) 98.2% pass through 1 cm and 1.8% are absorbed. Within the entire upper layer (0 to 15 cm) about 83% of the energy is absorbed. At a depth of 4 cm already half of the incoming radiation energy is absorbed and at 180 cm not more than 1% of radiation is left. For measurements in firn snow a more sensitive instrument was constructed with a sphere diameter of 12 mm, which was used to determine the extinction coefficient of the firn in the firn basin of the Hintereisferner (3000 m altitude) the result being 0.230/cm (density 0.55 g/cm^3). In firn snow 21% of the radiation is absorbed and 79% transmitted per 1 cm. Down to a depth of 3 cm 50% and at 10 cm 90% of the incoming radiation is absorbed. 1% only is penetrating deeper than 20 cm. For measurements in layers with different temperatures a two-sphere element was developed. Both the soldered joint for comparison and the measuring solder joint are constructed here in the same manner in form of spherical radiation receivers the first one coated, however, with a highly polished silver surface. The sensitivity of the two-sphere element is, according to the developed theory, not exactly but, for practical measurements, sufficiently independent of temperature. *Subject Heading:* **1. Radiation absorption by glaciers.**—*Authors' abstract.*

11.11–107 551.508.25:551.508.72

†Pereira, H. C. (*East African Agric. & Forestry Res. Organiz., Muguga, Kenya*), **Practical field instruments for estimation of radiation and of evaporation.** *Royal Meteorological Society, Quarterly Journal*, 85(365):253–261, July **1959.** 4 figs., 2 tables, 19 refs., eq. **DWB, DLC**—A distillation instrument for the integration of radiation, described by Bellani in 1936, rebuilt in modern materials by Gunn, Kirk and Waterhouse (1945), has a thermal efficiency of over 75%. The improved instrument, mounted at ground level in East Africa, with the condenser underground in constant cool conditions, had a performance that justified manufacture. Comparisons of the manufactured instruments with a Kipp solarimeter gave high linear correlations. These results show the distillation instruments, when so calibrated, to be useful for field estimations of solar radiation. Their cost is low and the daily estimate of total radiation is quickly obtained from a simple burette reading. Ten years' data for these Gunn-Bellani integrators are compared with those from 4 ft diameter open water pans. A mounting is described for these pans in shallow revetted pits where their sides are shielded from the sun and are insulated from the soil by an air space. A linear correlation based on 164 ten-day means accounts for 85% of the variability. It appears that in the high-altitude tropics this radiation integrator by itself can give the basic data for adequate estimate of water use by vegetation, and for control of irrigation. *Subject Headings:* **1. Solar radiation instruments 2. Evaporation instruments 3. Gunn-Bellani integrator.**—*Author's abstract.*

11.11–108 551.508.765:551.575.1

Bricard, J.; Deloncle, M. and Israël, G., **Étude photoélectrique individuelle des gouttes de brouillard.** [Photoelectric study of fog drops.] *Annales de Géophysique*, Paris, 15(3):415–417, July/Sept. **1959.** 3 figs., 4 refs. **DLC**—Description of the equipment and the measurement method which determines simultaneously, in a cloud of droplets, the number by unit of volume and the sizes of the particles by measuring the luminous flux they diffuse. The variation of luminous intensity diffused by drops is determined by their sizes. *Subject Headings:* **1. Fog particles 2. Drop size measurement.**—*A. V.*

11.11–109 551.508.822:551.521.1

Perlat, A. (*Météorologie Nationale, Paris*), **Etude de paresoleil pour radiosonde.** [Study of radiation shields for radiosondes.] *La Météorologie*, Paris, Ser. 4, No. 53:55–62, Jan./March **1959.** 4 figs., 7 refs. French, English and Spanish summaries p. 55. **DWB**—An experimental study is presented on radiation shields for radiosondes for the purpose of eliminating the errors

due to inertia and radiation. The corrections determined during comparison experiments, made in Payerne in 1956, are discussed. During his experiments, the author adopted two devices. In the first experiments he placed a second, narrower radiation shield inside the first shield, an air current of about 2 cm thickness being maintained between the shells of the two chimneys. In the last experiments, the radiosonde thermometer was placed in the jet of a Venturi. Comparison of radio soundings shows that measurements may be improved by the choice of an appropriate radiation shield. The Venturi type gives increased ventilation and the air current touching the thermometer is less turbulent. These properties tend to diminish the thermometer inertia and the heat exchanges between the shells of the radiation shield and the biplate. The sonde with the new radiation shield gives gradient inversions with a larger amplitude and indicates the distinct tropopause inversions at a lower height than with an ordinary sonde. *Subject Headings:* **1. Radiation errors of radiosondes 2. Radiosonde ventilation 3. Radiation shield on radiosondes.**—*A. V.*

11.11–110 551.508.85:551.507.352 551.510.62:621.396

†Ament, W. S. (*Naval Res. Lab., Wash., D. C.*), **Airborne radiometeorological research.** *Institute of Radio Engineers, N. Y., Proceedings*, 47(5, Pt. 1):756–761, May **1959.** 7 figs., 26 refs. **DWB** This paper deals with the Naval Research Laboratory's air-borne research in military radar and propagation problems. The military problems include predictions of radar and propagation conditions at specific places and times, and hence, fruitful research must be directed at establishing the geophysical causes of signal behavior. The flying laboratory system for quantitative measurements of ground and sea-clutter and of microwave field strength is described, and some of the experimental conclusions given. Philosophy and equipment of a new research aircraft for radar and propagation studies is described, and its optimum use in air-borne propagation research is outlined. *Subject Headings:* **1. Radio meteorology investigations 2. Airplane propagation observations.**—*Author's summary.*

11.11–111 551.508.85

Atlas, David and Mossop, S. C., **Calibration of a weather radar using a standard target.** *American Meteorological Society, Bulletin*, 41(7):377–382, July **1960.** 3 figs., table, 6 refs., 8 eqs. **DWB.** Also issued as: London. Imperial College of Science and Technology. Dept. of Meteorology, Contract AF 61(052)-254, Technical (Scientific) Note, No. 1, Sept. **1959.** 18 p. 3 figs., table, 6 refs., 3 eqs.—A simple method is described for calibrating a weather radar by means of a standard spherical target, thus permitting the radar to be used for quantitative measurements of storm reflectivity. The technique involves determination of that storm reflectivity which provides an echo equivalent to that from the known target. The sphere, suspended from a balloon, is tracked as it leaves the radar site. Its echo is "measured" by reducing the receiver gain control to the threshold of visibility. The threshold gain setting is thereby calibrated and subsequently provides an accurate measure of storm reflectivity. There is no need for any other test equipment such as a microwave signal generator. Absolute accuracy is greater than that attainable with a signal generator since no reliance need be placed on the generator calibration or upon the specified antenna gain. *Subject Heading:* **1. Weather radar calibration.**—*Authors' abstract.*

11.11–112 551.508.91:551.574.11

Fenn, R. W. and Weickmann, H. K., **Some results of aerosol measurements.** *Geofisica Pura e Applicata*, Milan, 42:53–61, **1959.** 7 figs. **DLC**—Newly developed freezing nuclei meter is described. Results of measurements made with this instrument in New Jersey, California and in the Thule area, Greenland, are shown. These data are compared with measurements of condensation nuclei, simultaneously made with the General Electric and the Aitken-nuclei counters. Also the results obtained from some measurements of the light-scattering function of the aerosol in industrial areas near New York City are presented. *Subject Headings:* **1. Freezing nuclei 2. Condensation nuclei 3. Aerosol meters.**—*Authors' abstract.*

11.11–113 551.508.91:551.510.42

Nader, John S. (*Robert A. Taft Sanitary Eng. Center, Cincinnati*), **Instrumenting the study of the air pollution problem.** *Institute of Radio Engineers, N. Y., Proceedings*, 47(5, Pt. 1):988–

990, May 1959. 16 refs. **DWB**—A brief discussion is given outlining the problems of air pollution and the necessary instrumentation. The conventional types of instruments in general use are summarized, and a review of special developments is given. Attention is called to the design and development requirements of instruments needed for current and future studies of the air pollution problem. *Subject Heading:* **1. Atmospheric pollution instruments.**—*Author's abstract.*

11.11–114 551.508.91:551.574.11:551.575.1

Pollak, L. W. and Metnieks, A. L., **Further investigations of the fog in the photo-electric condensation nucleus counter.** *Geofisica Pura e Applicata*, Milan, 42:89–107, 1959. 8 figs., 6 tables, 7 refs., 7 eqs. German and English summaries p. 89–90. **DLC**—The effect on extinction of isothermal distillation, shrinking of the droplets by evaporation without recondensation of the liberated water vapor, coagulation and differential settling of the fog droplets which take place in the fog of a photoelectric nucleus counter and which can produce a small additional extinction ("creep") in the first seconds after its formation, were numerically examined. The relative contribution of each process to the total creep observed is assessed. It is found that isothermal distillation can produce amounts of creep (up to 1.70%) which exceed considerably those caused by evaporation or coagulation. The results of these computations explain the occurrence of creep with concentrations greater than approx. 25,000 nuclei/cm³ in fog-tubes of 3.85 cm air-column diameter. That the disappearance of creep in fog-tubes of diameters 2.5 cm and less is due to the accelerated heat-flow from the walls of the narrow fog-tube was previously proved by reducing appropriately the diameter of the light pencil through the fog. In order to meet the objection that by restricting the cross section of the light pencil the fine structure of the fog comes into play, the increase in the travel time of the heat from the walls was achieved this time by using a photoelectric counter with a fog-tube of 8 cm diameter and a light beam of 2.8 cm diameter as in the "Standard Counter 1946." As expected, creep was found in every single measurement up to readings of 53%. Typical examples of the galvanometer pointer-movement and photographic records of the extinction during fog formation in such a wide fog-tube for readings between approximately 10 and 76% are given and their peculiarities discussed. The extinction over the range from 175,000 to 20,000 nuclei/cm³ was also measured with a red and a blue monochromatic interference filter and the results contrasted against the computed extinctions for these two wave lengths. It was ascribed that for the same number of nuclei the extinction for red light is in general larger than that for blue; the difference between the observed extinctions varies considerably, becoming zero or even negative. The most striking feature, however, is the different course of the extinction for the two wave lengths as a function of the number or size of the droplets. The size of the fog droplets in the counter was deduced from the extinction measurements for these two wave lengths and by collecting the falling droplets on coated slides. The radius of the droplets obtained by the optical method varies from 1.81 to 3.19μ when the extinction decreases from 86 to 56%. The radius of the droplets as deduced from gelatine coated slides dyed with Naphtol Green B increases from 1.44μ at 67.4% extinction (42,000 nuclei/cm³) to 6.30μ at 15.6% (858 nuclei/cm³). *Subject Headings:* **1. Photoelectric nuclei counters 2. Fog nucleation 3. Fog studies.**—*Authors' abstract.*

11.11–115 551.508.91 551.510.42

†*Rötschke, Martin, **Untersuchungen über die Meteorologie der Staubatmosphäre.** [Meteorological research in dust of the atmosphere.] *Leipzig. Universität. Geophysikalisches Institut, Veröffentlichungen, Ser. 2*, 11(1):1–78, 1937. 33 figs., 9 tables, 46 refs. **DLC**—A first-class monograph on all aspects of dust in the atmosphere: technical (methods of measurement, instruments, size and falling speed of particles); diurnal distribution at ground under different cloud, radiation and urban situations; effect of slope winds (i.e., at Collmberg); effect of meteorological elements on dust or vice-versa (visibility, wind, fog, clouds, air masses); effect of forests on dust distribution. Numerous diagrams show location with respect to surroundings, etc. *Subject Headings:* **1. Dust in atmosphere 2. Dust measurement 3. Forest influences on dust distribution 4. Konimeters 5. Collmberg, Germany.**—*M.R*

SYNOPTIC ANALYSIS AND FORECASTING

See also: **Numerical forecasting**, 11.11–2; **Numerical time integration of vorticity equation** (Miyakoda), 11.11–129; **Frontal effects on fog forecasting** (Mishutin), 11.11–164; **Synoptic conditions for frost, Kursk and Belgorod areas** (Kremenskaia, Nikitenko), 11.11–183; **Frost prevention** (Dinkelacker, Aichele), 11.11–184; **Frost prevention** (Brooks, Schultz), 11.11–185; **Frost protection** (Primault), 11.11–186; **Synoptic conditions for heavy rainfall** (Portig), 11.11–238.

11.11–116 551.509.21

§Scherhag, R., **General survey on the weather situation during the Seminar period by means of daily weather maps.** *Berlin. Freie Universität. Institut für Meteorologie und Geophysik, Meteorologische Abhandlungen*, 9(1):145–223, **1960.** 73 figs. **DWB**—In order to perform the analysis of the weather maps in a most efficient way, all maps drawn in Rome were reanalyzed. For this purpose the maps were supplemented by the observations from Africa received from the German Weather Centre at Offenbach to which I am very much indebted for granting us this additional material. Due to the limited facilities for reproducing weather maps in a printed book however, it was neither possible to publish all observations entered on the work maps available for the respective period. It was necessary to choose a scale for the maps in such a way that it was possible, without reducing too much the region covered, to enter so many stations as to make the observations substantiate the analysis. Thus the maps containing the Mediterranean area include the whole region of Northern Africa, too. The 0000 GMT maps, however, were replaced by surface and 500 mb charts covering the whole of Europe and the North Atlantic region in order to make possible a survey on the general weather situation. I wish to thank my assistants Dr. Ingrid Jacobs and Dr. G. Warnecke for having done a great deal of the analysis work, and Dr. H. Hugo, Mr. Joachim, Mr. Meyer, and all the students of my Institute who prepared the maps. *Subject Headings:* **1. Synoptic analyses of Mediterranean Region 2. Synoptic case histories 3. Mediterranean Region.**—*Author's introduction.*

11.11–117 551.509.312:551.515.1/8(262)

Sutcliffe, R. C., **Depressions, fronts and air mass modification in the Mediterranean.** *Berlin. Freie Universität. Institut für Meteorologie und Geophysik, Meteorologische Abhandlungen*, 9(1):135–143, **1960.** 3 figs. English summary p. 17–18. **DWB**—From the theory of baroclinic depressions it is well known that in the early stages they may be regarded as unstable wave disturbances forming in a baroclinic zone and moving with a speed comparable with that of the mean current. The methods of dynamical weather prediction by numerical calculation have given similar results but are not restricted to small amplitudes. Depressions of the Mediterranean considered in the light of this general theory have certain peculiarities: (a) Very few (less than 10%) form outside the Mediterranean region and move into the region later. In other words the Mediterranean is a cyclonic source region. (b) The distortion of the flow pattern is not generally initiated in an unstable wave-like manner but is typically a forced distortion due to orographic obstructions. (c) In the early stages orographically induced disturbances do not move as baroclinic waves but tend to remain stationary or only slowly moving. Rapid accelerations are however liable to occur. Although Mediterranean depressions have fronts, the classical warm-sector-occlusion model will not fit satisfactorily without considerable modification. Neither is it to be expected that numerical methods, as developed so far, will deal with the smaller scale features although they may be successful with the large scale pattern, as of importance in forecasts beyond 24 hours ahead. Empirical studies of the types of cyclonic development, source regions and preferred tracks, provided they are related with the upper air flow patterns, are helpful. Air mass modification is particularly important, especially because of discontinuity of surface boundary condition across the coast lines. This is very pronounced in winter with winds from the continent of Europe and it makes the Mediterranean comparable, on a smaller scale, with the sea areas of the east of North America and Asia (also in winter): frequent cyclogenesis, the "Mediterranean front," maximum of evaporation, development of vertical instability. In summer the mean temperature of the sea surface of the Mediterranean is almost everywhere below that

of the air. This is consistent with vertical stability and little evaporation and it is brought about partly by advection but mainly by subsidence. Finally, recent studies of fronts near the British Isles show structures very different in the upper levels from those implied by the classical disciplines of upslide surfaces. There is a need for observational studies of frontal cross-sections in the Mediterranean to support theoretical work on frontogenesis and frontolysis. *Subject Headings:* **1. Frontal analysis 2. Numerical forecasting 3. Air mass modification 3. Mediterranean Region.**—*Author's abstract.*

11.11–118 551.509.**314**:551.**515.23**:519.241.1

Wang, Griffith (*Civil Air Transport, Taiwan*), **A method in regression equations for forecasting the movement of typhoons.** *American Meteorological Society, Bulletin*, 41(3):115–124, March **1960.** 8 figs., 3 tables, 3 refs., 3 eqs. **DWB**—Based on six years (1950 through 1955) of typhoon data, three equations are formulated for the purpose of forecasting the movement of typhoons. In these equations, the following criteria at the 700 mb level are accounted for: (1) the contour height and its tendency at a point 10 deg of lat. north of the typhoon center, (2) the contour height and its tendency at a point 10 deg of lat. from the typhoon center and 90 deg to the right of its direction of motion, (3) the contour height and its tendency at a point 10 deg of lat. from the typhoon center and 90 deg to the left of its direction of motion and (4) the intensity and orientation of the major axis of a subtropical high cell which plays the role of steering the movement of the typhoon. Typhoon data collected during the years 1956 through 1958 are used for verification. With use of these equations, results of forecasting a 24 hr typhoon movement are found to be of practical value. *Subject Headings:* **1. Typhoon movement forecasting 2. Regression equations.**—*Author's abstract.*

11.11–119 551.509.**317**:551.**547**:551.**524.7**(98)

Orvig, Svenn, **Extrapolation of 25 mb heights and temperatures over North America north of 50°.** McGill Univ. Arctic Meteorology Research Group, Contract AF 19(604)-3865, Scientific Report No. 3; Publication in Meteorology, No. 14, May **1959.** 15 p. 3 figs., 3 tables, 7 refs., eqs. **DWB** (M(051) M145sc)—In connection with the daily analysis of synoptic charts for the north polar regions for 200, 100 and 25 mb, and cross sections along the 80°W meridian from Charleston to Eureka, and from Whitehorse to Alert and Nord, objective techniques were developed for extrapolating from 50 mb to 25 mb, and these techniques and the nomograms used in this analysis are presented and described along with data on the 25 mb level and features thereof from 41 stations, 10 of which are between 70° and 90°N, 14 from 60° to 70°N, and 17 from 50° to 60°N. Data covers alternate months from July 1957 to May 1958 (5577 ascents). Mean height of 25 mb surface is greatest in July and least in January. *Subject Headings:* **1. Stratospheric analysis 2. 25 mb heights over Arctic 3. Arctic analysis 4. Arctic 5. Canada.**—*M.R.*

11.11–120 551.509.**317**:551.**515.8**(4)

Pothecary, I. J. W., **Modification of warm maritime airstreams over Europe in winter.** *Meteorological Magazine*, London, 89(1050):1–7, Jan. **1960.** 3 figs., 4 tables, 3 refs. **DWB, DLC**—125 occasions were selected when stable warm maritime air moved over cold ground in winter; 12-hr trajectories were computed and the change in thickness in the 1000–500 mb layer determined. Estimates were made of the net flux of heat into or out of the layer due to long-wave and solar radiation and evaporation and were compared with the observed thickness changes. By night the estimated mean heat flux was -194 cal cm^{-2} (12 hr)$^{-1}$ while the mean observed thickness changed by -41 m (12 hr)$^{-1}$ (equivalent to a temperature change throughout the layer of -2°C). By day during the midwinter period the corresponding figures were -120 cal cm^{-2} (12 hr)$^{-1}$ and -25 m (12 hr)$^{-1}$. There was however, a large scatter of values about the mean and, after discussing possible causes of this, the conclusion was reached that dynamical processes were important, even though the causes were selected as far as possible to minimize these effects. An incidental result of some interest was that the net loss of heat by long-wave radiation from the 1000–500 mb layer in warm stable airstreams was largely

independent of the amount of cloud below 5,000 ft. *Subject Headings:* **1. Air mass modification 2. Synoptic analysis of air masses 3. Europe.**—*Author's abstract.*

11.11–121 551.509.327:551.515.2(715/716)

McLeod, K. T. (*Canadian Met. Service*), **The Northumberland Strait storm in Canada.** *Weatherwise*, Boston, 12(4):161–162; 176, Aug. **1959.** 2 figs. **DWB** –On June 19, 1959, a storm moved inland from the Atlantic Ocean swamping fishing boats and causing considerable loss of life. Prior to the storm the weather had been of a stable, repetitive type. The usual easterly movement of weather systems over Canada and the Northern States had been blocked by an area of high barometric pressure. A series of storm centers with associated cloud and rain moved northeastward. East intensified slowly then, blocked by high pressure recurved to the northwest and west and died away. The paper describes the condition before the storm and its features which proved to be of tropical nature resembling a miniature hurricane. Storms of this intensity rarely occur in the Maritimes in June and July. It is stated that the movement and changing intensity of weather areas are governed by the characteristics of the air aloft which flows in giant rivers, whirls and wavelike motions. The contrasting temperatures, wind and moisture of adjacent air masses create instabilities. Eddies are generated that grow in size and intensity and by their ascending air flows lead to the cloud, rain and wind of the storms. The paper includes two figures, one showing the path of the storm and the other a 500 mb constant pressure chart. *Subject Headings:* **1. Storm forecasting 2. Synoptic case histories 3. Tropical storms over Maritime Provinces 4. Northumberland Straits, Canada.**—*I.S.*

11.11–122 551.509.329:551.461.2:681.14 551.556.8:551.465

Lebel, F. and Gelcé, R., **La prévision numérique de l'état de la mer à l'aide d'un calculateur.** [The numerical forecasting of sea-state by means of an electronic computer.] *Journal de Mécanique et de Physique de l'Atmosphère*, Paris, Ser. 2, 1(2):81–99, April/June **1959.** 6 figs., 7 refs., 16 eqs. French, English and Spanish summaries p. 81. **DWB**—Formulation of a calculation program which makes it possible to draw up charts of sea-state with the Pascal electronic computer, actually under construction on behalf of the Météorologie Nationale (France). The spectroangular density method, successfully used at Casablanca since 1956, is adopted for electronic computation. The authors explain this method and describe its use in consideration of the effect of the earth's curvature and of the problems of limits bound to the existence of the coasts. This method is differential and local as it considers the growth, the propagation and the damping of the swell under the action of the wind blowing on infinitely small area elements. The last part of the article deals with the program of swell calculation based on a model sufficiently near the physical reality. A figure schematizes the whole of the calculation program and explanations are given for the principal operations of this program. *Subject Headings:* **1. Sea level forecasting 2. Ocean swell calculations 3. Electronic computers 4. Wind effects on ocean currents.**—*A.V.*

11.11–123 551.509.33:681.14:612.3

Sutcliffe, R. C. (*Met. Office*), **The future of weather forecasting.** *Weather*, London, 14(5):163–169, May **1959. DWB, DLC**—A long discussion of philosophical and meteorological aspects of weather and long range forecasting as compared with other lines of scientific activity —in particular the prospects for the future in the light of recent advances in science, communications, electronic computers, instrumentation, etc. on the one hand and increasing demands from the public, on the other. *Subject Heading:* **1. Forecast improvement.**—*M.R.*

11.11–124 551.509.333:551.552:551.542.1

Peshkova, I. I., **K voprosu o roli ageostroficheskikh otklonenii vetra v formirovanii poleĭ absoliutnogo geopotentsiala.** [The role of ageostrophic wind deviations in the formation of absolute geopotential fields.] *Meteorologiia i Gidrologiia*, Leningrad, 6:39–41, June **1959.** table, 9 refs., 4 eqs. **DWB, DLC**—The author attempts to evaluate the influence of the ageostrophic factor of atmospheric movement upon the formation of local variations in the mean monthly fields of the absolute geopotential. In the method of hydrodynamic long range forecasting of atmospheric pressure the initial data on time averaged fields of the corresponding

meteorological elements. From the equation for the vertical components of the vortex velocity the author illustrates the derivation of the formula:

$$\frac{\partial \bar{H}}{\partial t} = \frac{1}{ml}(\bar{H},\Delta) + \bar{H}\frac{l^2}{m}\left(\frac{\partial \bar{u}}{\partial x} + \frac{\partial \bar{v}}{\partial y}\right) + \delta N$$

for determining the variation of the geopotential associated with its annual variation and produced by uneven influx of solar radiation into the atmosphere. This formula was used to forecast mean monthly local variations of geopotential heights of the 700 mb layer for each of 3 months in the U. S. for 11 points. The success of the forecast of the mean monthly anomaly of the absolute geopotential 700 mb surface is illustrated in a table. The results indicate the need for taking into account ageostrophic motion in long range weather forecasts. *Subject Headings:* **1. Ageostrophic winds 2. Geopotential height forecasting 3. Long range forecasting.**—*I.L.D.*

ARTIFICIAL PRECIPITATION

See: **Atomic explosion effects on precip.** (Pflugbeil), 11.11–233.

STRUCTURE AND PHYSICS OF THE ATMOSPHERE

DENSITY AND COMPOSITION

See: **Planetary atmospheres** (Urey), 11.11–37; **Atmos. composition,** 11.11–95; **The atmos. as a radiation filter** (Schulze), 11.11–179.

ATMOSPHERIC POLLUTION

See: **Air pollution symposia** (Frenkiel, Sheppard), 11.11–4; **Air pollution instruments** (Nader), 11.11–113; **Dust measurement** (Rötschke), 11.11–115; **Chimney plume behavior** (Scorer), 11.11–138; **Stack effluent diffusion** (Smith et al.), 11.11–187.

UPPER ATMOSPHERE—IONOSPHERE

See: **Sec. D2,** p. 1773; **Solar eruptions** (Michard), 11.11–33; **Stratospheric wind and temp. data, North America** (Lowenthal, Arnold), 11.11–189.

RADIO METEOROLOGY

See: **Ionospheric absorption** (Davies), 11.11–50; **Ionospheric radio wave polarization** (Little, Lawrence), 11.11–54; **Ionospheric radio wave propagation** (Watts, Davies), 11.11–57; **Ionospheric radio wave refraction** (Weisbrod, Colin), 11.11–59; **Ionospheric radio wave scattering** (Wheelon), 11.11–60; **Radio frequency disturbances** (Buyse), 11.11–63; **Geomag. effects on radio wave propagation** (Wait, Spies), 11.11–75; **Radio met. investigations** (Ament), 11.11–110.

MECHANICS AND THERMODYNAMICS OF THE ATMOSPHERE

See also: **Atmos. diffusion symposia** (Frenkiel, Sheppard), 11.11–4; **Dynamic met.** (Kopcewicz), 11.11–7; **Turbulence theory applications to wave propagation** (Tatarskiĭ), 11.11–13; **Zonal circulation variations** (Blinova, Marchuk), 11.11–140; **Cyclone movement characteristics based on hydrothermodynamics equation** (Sadokov), 11.11–147; **Instability line in thunderstorms, Japan** (Ohsawa), 11.11–159; **Turbulent transfer of heat** (Yamamoto, Kondô), 11.11–188; **Geopotential height changes** (T'u), 11.11–201; **Air mass transformation** (Vorontsov), 11.11–212; **Kinetic energy of rainstorms** (Wischmeier), 11.11–239; **Study of turbulence in climat.** (Panchev), 11.11–254.

11.11–125 551.511:551.577.21(52)

Noguchi, K.; Itō, U. and Ōkubo, T. (*all, Sendai Dist. Met. Obs.*), **A numerical treatment of various causes on precipitation and especially on the importance of convective instability.**

Meteorological Society of Japan, Tokyo, Journal, Ser. 2, 37(1):1–9, Feb. **1959.** 15 figs., 4 tables, 9 refs. Japanese summary p. 9. **DWB, DLC**—During a series of rains, we often have a period during which we have excessive rainfall whose cause we could not understand. Selecting two examples from these cases, we have estimated carefully effects due to topography, large scale disturbance, frontal friction and convective instability. The results of the estimations are shown in this paper. And it is emphasized that the effect due to convective instability on the amount of precipitation may be of greater magnitude than the other factors. *Subject Headings:* **1. Convective rainfall 2. Japan.**—*Authors' abstract.*

11.11–126 551.511:551.521:551.579.2

Onufrienko, L. G., **Intensivnost' snegotaianiia i vodootdacha iz snega.** [Snow melting intensity and the water yield from snow.] *Kiev, Ukraine. Nauchno-Issledovatel'skiĭ Gidrometeorologicheskiĭ Institut, Trudy*, No. 19:3–24, **1959.** 3 tables, 15 refs., charts, 10 eqs. **DWB**—Of all contemporary methods of computing the intensity of snow melt for water catchment areas characterized by strongly dissected relief the most useful is the intensity computed according to air temperature, which during transition to water yield in the first phase of flood water should be reduced to the value of the water retention capacity of snow. After occurrence of the peak of flood water, the magnitude of intensity of melting is used without change. The intensity of snow melting for an open plain was computed by the heat balance method according to the simplified method of P. P. Kuz'min employing the equation

$$m = a\gamma u + 15\,[(I' + i)(1 - r) - R]$$

where m = layer of water in mm for 2 hrs, $a\gamma u$ = magnitude of layer of melt water resulting from heat exchange with water, $15\,[(I' + i)(1 - r) - R]$ = magnitude of layer of melt water resulting from radiational heat exchange. The computation of the parameters in this formula are discussed. The formula of E. G. Popov, also based on heat exchange, for computing the intensity of snow melt in the daylight hours in mm for 12 hrs is presented and the intensity of snow melt computed according to this formula, that of Kuz'min and that of temperature for the Lipino ravine during the spring of 1956 are compared. The values of the intensities of the snow melt computed according to the heat balance method of Kuz'min are greater than those according to the Popov method and according to air temperature. Water yield is measured by the method of A. G. Kozel', namely $h_T = (1/\gamma)\beta k W_T$ where h_T = mean melt water runoff at moment T for the entire area of the catchment basin, β = extent of snow cover of catchment basin, k = coefficient of water yield $k = 1/1 - \alpha$, γ = latent heat of ice fusion, W = layer of melt water in mm. For small catchment basins the magnitude of intensity of snow melt and water yield computed by these methods proved to be too high. For periods in which advective snow melt predominates, when the air temperature completely reflects the course of snow melt, the Popov formula is applicable. An appendix contains tables giving values of intensity of snow melt for computation according to air temperature for catchment areas of the Pridesniansk runoff station, and values of intensity of snow melt computed according to the Kuz'min method and water yield of snow according to the Kozel' method in the catchment basins of the Pridesniansk runoff station for the spring of 1956. *Subject Headings:* **1. Snow melt intensity computation methods 2. Radiation effects on snow melt 3. Snow melt formulas.**—*I.L.D.*

11.11–127 551.511.2

Kuo, Hsiao-Lan (*M.I.T.*), **Finite-amplitude three-dimensional harmonic waves on the spherical earth.** *Journal of Meteorology*, Boston, 16(5):524–534, Oct. **1959.** 6 figs., 14 refs., 53 eqs. **DWB, DLC**—By making use of the quasi-nondivergent approximation, the potential vorticity equation is reduced to an equation in the stream function. Assuming that the motion is of permanent wave type, a first integral of this nonlinear vorticity equation is obtained, which itself is a linear three-dimensional partial differential equation in ψ. This equation has been solved as a boundary-value problem by the method of separation of variables. It is found that the latitudinal-amplitude functions of these waves satisfy a spheroidal-wave equation while the vertical-amplitude functions are given by Bessel and Hankel functions

of the argument $l\sqrt{p/p_0}$, where l is a parameter depending on both the static stability and the nodal number r. The eigenvalues μmr of these wave solutions are connected with the parameter l^2 by a transcendental relation. We have expanded μmr into a power series of l^2 and obtained the various coefficients, up to that of the fourth power of l^2. The latitudinal- and vertical-amplitude functions for the wave numbers $m=0$, 3, and 6 have also been obtained. Because of the additional degrees of freedom introduced by the vertical variation of ψ, it is possible to obtain a combination of the partial-wave solutions which can approximate the observed motions in the atmosphere more closely than the solutions of the purely two-dimensional vorticity equation can. When the effect of friction is included, these harmonic waves will be damped in time. *Subject Headings:* **1. Three-dimensional harmonic waves 2. Vorticity equations.**—*Author's abstract.*

11.11–128 551.511.2:551.558.1:681.14

Malkus, Joanne S. (*Woods Hole Oceanog. Inst.*) and Witt, Georg (*Internatl. Met. Inst., Stockholm*), **The evolution of a convective element: a numerical calculation.** (In: Bolin, Bert (*ed.*), **The atmosphere and the sea in motion.** N. Y., Rockefeller Institute Press, **1959.** p. 425–439. 11 figs., table, 11 refs., 5 eqs.) **DLC**—The evolution of a convective element is studied, starting with the introduction of a specified distribution of buoyancy into a resting stratified fluid. Because of the interaction between temperature and motion fields, the differential equations describing the onset of convection are nonlinear and usually intractable to analytic solution, but they are well suited to integration in finite time steps on a high speed computer. The results of several cases programmed for one such machine (BESK) are reported here. We consider two-dimensional motions in vertical planes with central symmetry in a 640 m ty 640 m space. A lower unstable or neutral layer is topped by a more stable one. A potential temperature perturbation is introduced at the initial moment, with amplitude 0.5°C, half-width 160 m, slowly decaying with height. We set up in finite difference form equations governing the vorticity, temperature, and motion fields and solve them in a series of time steps. The calculation is ended after a time corresponding to five to seven minutes due to the growth of numerical errors. Five cases have been computed and compared to date, varying one of four initial or environmental parameters in each, namely instability, horizontal shape, frictional exchange, and the presence of the ground at the lower boundary of the perturbation. It was found that in each of the cases studied the initial perturbation developed into a mushroom-shaped bubble-like element exhibiting a rounded cap with a concentration of isentropes, and a vortex ring circulation at its edges. The early stage of development of the element has been found to consist of two phases. The first of these is an "organization phase," during which the cap and the vortex ring are formed accompanied by only slight upward motion. The second one is the actual ascent of the bubble. *Subject Headings:* **1. Evolution of convection 2. Two-dimensional motion 3. Convection calculation.**—*Authors' abstract.*

11.11–129 551.511.32:551.509.313

Miyakoda, K. (*Geophysical Inst., Tokyo Univ.*), **The method of numerical time integration of vorticity equation involving frictional term.** *Meteorological Society of Japan, Tokyo, Journal,* Ser. 2, 37(1):10–21, Feb. **1959.** 14 figs., 10 refs., eqs. Japanese summary p. 21. **DWB, DLC**—First, it is proved that the solution for frictional vorticity equation appears always computationally unstable, so far as the usual centered time difference method is used. As the substitute of the method above, another method to obtain a computationally stable and accurate solution is proposed. The principle is to apply the centered difference method only to the calculation of the advection term, and to apply the forward difference method in Taylor's series expansion form to that of the frictional term. *Subject Headings:* **1. Vorticity equations 2. Numerical forecasting 3. Difference equations.**—*Author's abstract.*

11.11–130 551.511.33:551.521.1:551.573

Grigor'ev, A. A., **Novoe napravlenie v meteorologii i fizicheskoĭ geografii.** [A new trend in meteorology and physical geography.] *Priroda,* Moscow, No. 6:52–54, June **1958.** photo. **DLC**—The author discusses the contribution of M. I. BUDYKO to the problem of the geographic zonality of natural processes. BUDYKO'S approach is based upon the assumption that the

processes of zonation depend primarily upon the distribution of the radiation and water balances over the surface of the earth and the associated heat and moisture exchange between the surface of the earth and the atmosphere. The work of BUDYKO included the study of evaporation from the earth's surface and its dependence upon various meteorological and physical geographic conditions, and the heat balance of the earth's surface; and he has worked out a climatography of heat balance and the spatial-temporal distribution of the elements of heat balance. BUDYKO has classified the physical relationships between meteorological elements and the normal runoff and coefficient of runoff. The more important conclusions of BUDYKO and his co-workers are summarized and his major publications are listed. *Subject Headings:* **1. Heat and moisture balance 2. Budyko, M. I.**—*I.L.D.*

11.11–131 551.511.33:536.25

Nakagawa, Y. (*Enrico Fermi Inst. for Nuclear Studies, Chic. Univ.*), **Experimental observations of overstable cellular convection.** *Royal Society of London, Proceedings, Ser. A*, 253(1273):212–217, Nov. 24, **1959.** 5 figs., 13 refs. **DWB**—In this paper, experimental observations of the overstable cellular convection which occurs in a layer of mercury heated uniformly from below, and subject to Coriolis forces, are described. The observations confirm Chandrasekhar's theoretical predictions regarding the wave number of the cells and of the characteristic period of the oscillatory motions. A detailed analysis of the movement of tracers clearly illustrates the periodic reversal of the convective circulation and the hexagonal pattern of the convection cells. *Subject Heading:* **1. Cellular convection.**—*Author's abstract.*

11.11–132 551.511.6

Calder, Kenneth L. (*Fort Detrick, Md.*) and Milly, George H. (*Army Chemical Center, Edgewood, Md.*), **[Comments on] William G. Tank: The use of large-scale parameters in small-scale diffusion studies, [and] Reply by Tank.** *American Meteorological Society Bulletin*, 40(6):312–313, June **1959.** 2 refs. **DWB, DLC**—The theoretical basis of the paper under consideration (*see* 8.6–121, June 1957, *Met. Abs.*) is severely criticized. This is the classical Roberts' theory of atmospheric diffusion which is now clearly known to be at variance with observational data on small scale diffusion. Answering the criticism, TANK states that the intent of the article was not to imply that Roberts diffusion model should be used as a diffusion prediction equation when data availability permits the application of admittedly more precise models but rather to point out that, in the absence of such data, Roberts' equation will yield results as accurate as can reasonably be expected. *Subject Headings:* **1. Atmospheric diffusion calculations 2. Roberts atmospheric diffusion theory.**—*I.S.*

11.11–133 551.511.6:551.551:533.15

Dugstad, Ivar, **A generalization of Richardson's criterion of turbulence.** *Meteorologiske Annaler*, Oslo, 4(13):331–350, **1958.** 4 figs., 11 refs., 56 eqs. **DLC**—Osborne's turbulence criterion for a homogeneous incompressible fluid is presented and Richardson's criterion of turbulence is generalized by taking into account horizontal wind shear and the dynamic stability of the mean flow and developing the criterion with the aid of the dynamical method used by SIR DAVID BRUNT. "From the formulas it appears that a thorough knowledge of the velocity field and the temperature field is necessary, but the largest difficulty seems to be the measurement of the turbulence itself. Horizontal eddies are likely to be large compared with the vertical ones, and their effect on airplanes differs. The large horizontal eddies may cause large shear, both horizontal and vertical, along the borderline. The turbulence is mostly observed on the northern side of the jet stream. The cyclonic shear here often amounts to several times the Coriolis parameter, and the area is therefore favorable for horizontal eddies. It is often found that turbulence is patchy, but it is possible that this is due to a patchy distribution of detectable eddies rather than eddies in general." *Subject Headings:* **1. Richardson criterion 2. Turbulence.**—*Based on author's conclusions.*

11.11–134 551.511.6:551.553.1

Haltiner, G. J. (*U. S. Naval Postgraduate School, Monterey, Calif.*), **The diurnal variation of the wind.** *Tellus*, Stockholm, 11(4):452–458, Nov. **1959.** 6 figs., 4 refs., 9 eqs. **DLC**—

The equations of motion are numerically integrated under assumptions which represent the diurnal variation of the wind. The coefficient of eddy viscosity varies periodically with time as well as nonlinearly with height. The time variation is represented by two trigonometric terms giving a 20-fold change between maximum and minimum eddy viscosity. Several different functions were used to depict the vertical variation of the eddy viscosity, among which were an increasing, but bounded, exponential function, and also an exponential function which first increased with height and then decreased to a residual value. The boundary conditions imposed were, firstly, that the wind vanishes (or approaches a constant value) at the lower boundary; and, secondly, that the wind becomes geostrophic at some arbitrarily selected upper level. The solutions were in general agreement with observed data and showed the spiral characteristic of the planetary boundary layer. However, there is disagreement between theory and observation in some important features. *Subject Headings:* **1. Diurnal wind variations 2. Equations of motion 3. Eddy viscosity.**—*Author's abstract.*

11.11–135 551.511.6:532.517.4

Münch, G. and Wheelon, Albert D., **Space-time correlations in stationary isotropic turbulence.** *Physics of Fluids*, N. Y., 1(6):462–468, Nov./Dec. **1958.** fig., table, 16 refs., numerous eqs. **DWB. Comment** by Robert H. Kraichnan in *Ibid.*, 2(3):334, May/June, **1960.** 6 refs.—The correlation between Fourier velocity components at the same wave number k and two instants separated by a time τ is investigated for a homogeneous, isotropic, and stationary turbulent field. Ensemble averages of four velocity components are related to second-order averages as in a normal distribution. A power series in τ for the time-displaced kinetic energy spectrum $E(k,\tau)$ is derived and the coefficient of τ^2 evaluated explicitly using the Heisenberg spectrum for $\tau=0$. The asymptotic behavior of this term for an infinite Reynolds number R shows that the relaxation time associated with eddies of wave number k varies as k^{-1}. These results were verified by numerical integrations for finite large R. The resulting discrepancy with the dimensional result $\tau_k \alpha k^{-2/3}$ is ascribed to the nonuniversality of the method of analysis followed. A general integrodifferential equation for $E(k,\tau)$ is then derived and shown to admit solutions in similarity variables of the form $\xi = kr^{1/\beta}$. The case $\beta = 2/3$ corresponds to the Kolmogorov spectral law. Recent objections to the quasi-normal approximation are criticized briefly in an appendix. *Subject Headings:* **1. Isotropic turbulence 2. Fluid mechanics.**—*Authors' abstract.*

11.11–136 551.511.6

Ogura, Yoshimitsu (*M. I. T., Mass.*), **Diffusion from a continuous source in relation to a finite observation interval.** *Advances in Geophysics*, N. Y., Vol. 6, pub. **1959.** p. 149–159. fig., 11 refs., 28 eqs. **DWB, DLC**—This paper presents a brief summary of the author's previous analysis of turbulent diffusion for a finite observation interval and also some extension of it. The average rate of diffusion of particles from a fixed point is expressed as a function of the dispersion time and the observation time, for the special type of the Lagrangian velocity correlation function that has been derived from Kolmogorov's similarity theory. The result indicates that the mean-square dispersion proceeds as time cubed, when the dispersion time is equal to the observation time. The influence of finite sampling period on the mean concentration in smoke plumes is also discussed. *Subject Headings:* **1. Turbulent diffusion from a continuous source 2. Statistical theory of turbulence.**—*Author's abstract.*

11.11–137 551.511.6:551.524.4:551.551.8

Priestley, C. H. B. (*C.S.I.R.O., Div. of Met. Physics, Victoria, Australia*), **A determinant hypothesis for the superadiabatic wind and temperature profiles.** *Royal Meteorological Society, Quarterly Journal*, 86(368):232–236, April **1960.** fig., 2 tables, 12 refs., 7 eqs. **DWB, DLC** – The view is advanced that values of the Monin-Obukhov coefficients as they are obtained from field data, are products of smoothing rather than true physical constants of a steady regime intermediate between free and forced convection. This hypothesis provides a satisfactory prediction of the first coefficient and, if it is correct, reduces the dual problem of heat and momentum transfer in superadiabatic conditions to the specifications of four constants: von Kármán's constant, Priestley's free convection constant, and the ratio $K_H K_M$ in neutral and in free convection conditions. In inversion conditions it has yet to be shown whether the

constancy of stress and heat flux extend very far, if at all, above the level where significant departures from the neutral profile begin. Thus the basic assumption of some common current approaches still awaits examination. *Subject Headings:* **1. Superadiabatic wind profiles 2. Superadiabatic temperature profiles 3. Convection theories.**—*Author's summary.*

11.11–138 551.511.6:551.551:551.510.42:691.8

Scorer, R. S. (*Dept. Math. Imperial College*), **The behaviour of chimney plumes.** *International Journal of Air Pollution*, N. Y., 1(3):198–220, Jan. **1959.** 13 figs., 2 tables, 10 refs., 45 eqs. **DWB, DLC**—The formulas available for computing the pollution due to an isolated chimney are too complicated to be of any practical use. The weather conditions in which they are correct are not usually the most important that can occur. Therefore, some simpler formulas are proposed: but these have to be used with discretion and with an understanding of the complexities of the actual weather. The rise due to efflux momentum and buoyancy is calculated using simple formulas derived by dimensional analysis and simple experimental constants. The plume is assumed to be bent over when the upward velocity is about equal to the wind speed and the rise is assumed to be complete when the upward velocity is reduced to a certain fraction of the wind speed. When the rise is complete the effluent is carried passively by the ambient turbulence. The formulas acknowledge three different regimes in which the efflux momentum, the buoyancy, and ambient turbulence successively dominate the mixing process. When a plume contains liquid water an appreciable amount of heat may be lost when it evaporates on mixing with the environment. A diagram is given for computing the effect on the buoyancy. It may be enough to make the plume sink rapidly to the ground. Finally, it is argued that architects should accept the chimney heights necessary for the proper dispersal of pollution as a requirement and design their buildings with the chimney as an integral part instead of as an undesirable appendage. *Subject Headings:* **1. Atmospheric pollution formulas 2. Smoke plume behavior 3. Stack effluent diffusion.**—*Author's abstract.*

11.11–139 551.511.6:551.551.8

Taylor, R. J. (*C.S.I.R.O., Div. of Met. Physics, Aspendale, Australia*), **Similarity theory in the relation between fluxes and gradients in the lower atmosphere.** *Royal Meteorological Society, Quarterly Journal*, 86(367):67–78, Jan. **1960.** 7 figs., 2 tables, 14 refs., 14 eqs. **DWB, DLC**—Available data on wind and temperature profiles and heat and momentum fluxes in the lower atmosphere have been examined in the light of the similarity theory of MONIN and OBUKHOV (1954) and, except in conditions of very strong lapse where some doubt remains, reasonable agreement is found. The "log+linear" profile form is investigated and it is shown that, in lapse conditions, it is applicable only to a very limited range of stability corresponding approximately with forced convection conditions. The constant, α, which enters into this profile is about 6 and thus considerably larger than the value proposed by MONIN and OBUKHOV. The discrepancy is due to these authors' having applied the profile to a larger range of stability than is justified. Subject to the reservation expressed for the case of very strong lapse conditions, the similarity scheme has been shown to extend to free convection conditions where a $-\frac{1}{3}$ power form of profile is more appropriate. The relevant constants are estimated. *Subject Heading:* **1. Monin-Obukhov similarity theory.**—*Author's summary.*

GENERAL CIRCULATION

See also: **von Humboldt's isotherms** (Model), 11.11–181; **Ocean-atmos. interaction, N. Pacific** (Namias), 11.11–192; **Convective rainfall, Japan** (Syōno et al.), 11.11–234.

11.11–140 551.513.1:551.511.13:551.524.2

Blinova, E. N. and Marchuk, G. I., **K teorii godovogo khoda chisto zonal'noĭ tsirkuliatsii.** [Theory of annual variations is net zonal circulation.] *Akademiia Nauk SSSR. Institut Fiziki Atmosfery, Trudy*, No. 2:105–113, **1958.** fig., 2 tables, 4 refs., 18 eqs. **DLC** (Slavic)—The authors present a theory of the annual variation of the purely zonal circulation and compare this theory with empirical data. Beginning with the computation of annual variation

of the zonal distribution of temperature of the earth's atmosphere with the aid of the equation of heat advection the authors derive equations for computing the climatic monthly mean temperatures at sea level for January and July. The values are compared with actual values. A close correspondence was found; the greatest divergence between theoretical and computed data in middle latitudes was in the predominantly oceanic regions where the annual variation is considerably less than in continental regions. *Subject Headings:* **1. Zonal circulation variations 2. Temperature distribution.**—*I.L.D.*

11.11–141 551.513.1:551.543.2:551.465:532.59

†Fedorov, K. N., **O prichinakh polugodovoĭ periodichnost v atmosfernykh i okeanicheskikh protsessakh.** [The causes of semi-annual variations in atmospheric and oceanic processes.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geograf.*, No. 4:17–25, July/Aug. **1959.** 4 figs., 2 tables, 22 refs. **DWB**—Various studies indicating the reality of the semi-annual wave of atmospheric pressure wave are cited. In a series of processes determining the condition of the general circulation of the atmosphere or ocean the semi-annual periodicity with two maxima and two minima a year is the most characteristic and clear expression. The most apparent characteristic of such processes is the ratio of the amplitude of semi-annual wave (A_2) to the amplitude of annual wave (A_1), i.e. $r = A_2/A_1$. And for values of $r = 1$ the curve of annual variation of any element has two marked maxima and minima. A series of values of r for a series of observations over the ocean and in the atmosphere ranging from 2.34 to 12.00 are presented. Almost all regions of high r are situated over the ocean with the exception of an extensive area of $r = 1$ over Antarctica and two small areas at the western boundary of Europe and southern Alaska. Also the semi-annual pressure wave in the subtropical belt of high pressure of the Southern Hemisphere has a phase opposite to that of the semi-annual pressure wave in Antarctica. The author examines critically the explanation of the annual variation of atmospheric pressure over the earth and its semi-annual components presented by W. SCHWERDTFEGER and F. PROHASKA and demonstrates its inadequacy. The author attempts to show that the redistributing influence of the general circulation of the ocean plays a tremendous role in the fluctuating processes characterizing the atmospheric circulation of the Northern Hemisphere. A comparison of the annual variation of meridional differences of pressures in the region of westerlies and trades of the North Atlantic and North Pacific shows an absence of differences between oceans in respect to phases of annual phase and indicates that oscillations of this type have the same causes for both oceans. For the northeast trades such a cause is the intensified subtropic centers of high pressure in the summer; for the westerly winds the principal role is played by the deepening of the Icelandic and Aleutian lows and the corresponding phase of the annual wave of intensity of the westerlies is established. The oppositeness of phase of annual wave in the intensity of these two atmospheric currents is established. In turn, the difference of phase of semi-annual wave in the same atmospheric currents over different oceans and the similarity of phase in different currents over the same ocean indicates that the cause of the wave is to be sought in large scale processes with extensive energy, namely the circulation of oceanic waters. Data are presented on the phases of the semi-annual wave of the Gulf Stream and Florida currents and the Kuroshio current and compared with atmospheric currents. The origin of semi-annual wave is explained by the intensity of the atmospheric circulation and the strongest oceanic currents. *Subject Headings:* **1. Atmospheric circulation theories 2. Oceanic circulation 3. Semi-annual pressure waves.**—*I.L.D.*

11.11–142 551.513.1

Sheppard, P. S. (*Imperial College, London*), **The general circulation of the atmosphere.** *Weather*, London, 13(10):323–336, Oct. **1958.** 6 figs. **DWB, DLC**—An interesting and clear exposition of the general circulation from the point of view of its importance for a global approach to the atmosphere. Pertinent graphical illustrations are included with the text. The discussion opens with the assumption that the motion of the atmosphere is composed of a suitably formed mean motion upon which is superposed a spectrum of turbulent motions. This theme is further elaborated by first describing the three components of the mean motion of the air, and then discussing features of the associated turbulence. The final phase of the discussion is devoted to a description of a quantitative theory explaining the general circulation

as evidenced by a recent numerical experiment by PHILLIPS at Princeton. *Subject Heading:* **1. Atmospheric circulation.**—*I.S.*

11.11–143 551.513.2:551.557.5:551.542.1

Endlich, R. M. and McLean, G. S. (*both, GRD, AF Camb. Res. Ctr.*), **Geostrophic and gradient departures in jet streams.** *Journal of Meteorology*, Boston, 17(2):135–147, April **1960.** 5 figs., 2 tables, 21 refs., 4 eqs. **DWB, DLC**—Wind measurements made by aircraft of Project Jet Stream during forty-eight flights are compared with geostrophic and gradient winds (computed on upper air charts) in order to determine geostrophic and gradient departures. Due to random errors in radiosonde data and to a lesser extent in the aircraft winds, individual departures are not reliable. Therefore, the jet stream area, as represented on a vertical cross-section perpendicular to the wind flow, is arbitrarily divided into nine sectors. Average departures are computed for each sector and for certain combinations of sectors. In cyclonic jet streams (i.e., in the vicinity of upper troughs), these calculations gave the following results: observed wind speeds were, on the average, 27.5 kn (or 18.4%) less than geostrophic speeds but were in excellent agreement with gradient speeds. Although the average gradient departure was approximately zero, these departures tended to be negative (observed winds less than gradient winds) on the south side of the jet core and slightly positive on the north side. The standard deviation of this population of true geostrophic departures was 20 kn, while the standard deviation of true gradient departures was 6 kn. Gradient winds were therefore considerably superior to geostrophic winds as an approximation to observed winds in cyclonically curved jet streams. In straight jet streams, observed winds were 2.4 kn (2.8%) sub-geostrophic (and sub-gradient) on the average: however, this departure should be considered as essentially zero. Sub-geostrophic flow was most pronounced in the layer immediately above the jet core. Sufficient data were not available for determining the departures in anticyclonic jet streams. The statistical significance and theoretical consequences of the departures are discussed. *Subject Headings:* **1. Geostrophic wind errors 2. Gradient wind errors 3. Jet stream winds 4. Project Jet Stream.**—*Authors' abstract.*

11.11–144 551.513.2:551.557.5:551.515.1(691)

Prudhomme, A. and Valtat, B. (*both, Ingénieur des Travaux Met., Tananarive*), **Sur les "jets streams tropicaux," obsérves à Madagascar au cours de la saison chaude 1952–1953.** [Tropical jet stream observations in Madagascar during the hot season of 1952/1953.] (In Pan Indian Ocean Science Congress, Aug. 1954, Perth, Western Australia, **Proceedings of Section A, Physical Sciences,** (pub. **1958?**). p. 61–63. 5 refs.) Also: **Techniques of analysis in the jet stream region.** *Ibid.*, p. 58–60. **DWB** (506.35 P187pr) —The characteristics of the tropical jet stream are discussed. It is concluded that the turbulent motion of the jet stream is a critical factor in the development of tropical cyclones. A most effective, though approximate, method has been presented for the study of these cyclonic patterns in the jet stream region. It involves the preparation of pressure charts, 300, 200 and 100 mb streamline isotachs as well as temperature charts. The method is explained. *Subject Headings:* **1. Tropical jet stream 2. Jet stream-cyclone relationships 3. Madagascar.**—*N.N.*

11.11–145 551.501.7:551.513.2:551.557:629.13

†U. S. Navy Weather Research Facility, **Jet stream probing, 1956–1958. Interim Report on Task 15.** Jan. **1959.** 39 p. numerous figs., 5 refs.—Two series of jet flights through jet streams were made by AROWA in 1952–3 and 1953–4 (*see* 6.2–136 and 6.5–123). During winter and spring of 1957–8 a number (18) of additional flights were made along routes emanating in all directions (except over ocean to East) from Patuxent, Md. Aircraft, objectives, flight operations, flight forecasting and analysis, instrumentation, navigation, data recording, data processing and data evaluation are discussed in separate chapters and illustrated with charts and cross-sections, etc. Examples of LMW (layer of maximum wind) analysis and of time savings in transcontinental flights using LMW rather than 200 mb winds are cited and illustrated. Micro-variations in wind were found to be about 10% of mean wind. *Subject Headings:* **1. Jet stream reconnaissance 2. Jet stream analysis.**—*M.R.*

ATMOSPHERIC DISTURBANCES

See also: **Hurricane textbooks** (Dunn), 11.11-6; **Hurricane location** (Showalter), 11.11-105; **Frontal analysis** (Sutcliffe), 11.11-117; **Typhoon movement forecasting** (Wang), 11.11-118; **Air mass modification** (Pothecary), 11.11-120; **Storm forecasting, Northumberland Straits** (McLeod), 11.11-121; **Convection calculation** (Malkus), 11.11-128; **Jet stream-cyclone relationships** (Prudhomme, Valtat), 11.11-144; **Pressure wave-thunderstorm relationships** (Pasechnik), 11.11 196; **Rainfall and thunder during Bai-u** (Syōno et al.), 11.11-234; **Typhoons, Far East,** 11.11-235; **Frontal type precip.** (Parczewski), **11.11-237.**

11.11–146 551.515:551.577.2/3(73)

§Woffinden, Charles W. (*Extended Forecast Sec., U. S. W. B., Wash., D. C.*), **The weather and circulation of May 1959, including an analysis of precipitation in relation to vertical motion.** *Monthly Weather Review*, Wash., D. C., 87(5):196–205, May 1959. 12 figs., 10 refs., 5 eqs. **DWB, DLC**—The May pattern at the 700 mb level over the U. S. was one of large amplitude with a trough in the West and ridge in the East. Except for a short break, this system persisted throughout the month, bringing repeated outbreaks of cold maritime air into the western states and unusual warmth in the East. The well-marked mean frontal boundary thus established gave rise to frequent storminess and abundant rainfall over much of the country. *Subject Headings:* **1. Rainfall analysis 2. Troughs and ridges 3. Cold air outbreaks 4. United States.**—*Author's abstract.*

11.11–147 551.515.13:551.511.32

Sadokov, V. P., **K voprosu o napravlenii peremeshcheniia tsiklonov.** [The problem of the direction of movement of cyclones.] *Meteorologiia i Gidrologiia*, Leningrad, No. 8:33–36, Aug. 1958. 2 figs., ref., 8 eqs. **DWB, DLC. Comments** by E. D. Shekhtman, *Ibid.*, No. 3:56–57, March 1960.—Since the limitations and presuppositions usually assumed in respect to the steering current cannot be made in investigations of the direction of movement of pressure formations aloft, the author attempts to derive qualitative conclusions on the characteristics of the movement of cyclones aloft by means of the hydrothermodynamics equation. The assumption is made that an imaginary current is present in the atmosphere in the direction in which cyclones are moving and that the direction of this current does not coincide with the isohypses of the 700 mb surface (steering current). The equation for the vertical vorticity components written in the geostrophic approximation reveals the kinematic properties of the pressure field at a mean level $\frac{\partial \tau}{\partial p}=0$ and it can be written as $\frac{\partial \phi}{\partial t}+U\frac{\partial \phi}{\partial x}+V\frac{\partial \phi}{\partial y}=0$, where $U=-\frac{1}{\alpha l}\frac{\partial B}{\partial y}$, $V=\frac{1}{\alpha l}\frac{\partial B}{\partial x}$ and $B=\bar{\phi}+f(l)$; where $\bar{\phi}$=mean value of geopotential along a circle with radius R; $f(l)$=functions depending upon latitude and $\alpha=4$—a parameter. In investigating the displacement of cyclones the mean field of atmospheric flow is obtained by integrating $\Delta\frac{\partial \phi}{\partial t}+\left(\phi, \frac{\Delta\phi}{l}+l\right)=l^2\frac{\partial \tau}{\partial p}$ and obtaining finally

$$\frac{\partial \Pi}{\partial t}=-\frac{1}{2\pi}\int_0^{2\pi}\int_0^R \Delta\frac{\partial \pi}{\partial t}\ln\frac{R}{r}\,r\,dr\,d\varphi+\frac{1}{2\pi R}\int_{cR}\frac{\partial \Pi}{\partial l}\,dc.$$

The formula $\bar{B}=\int_{P_0}^{0} B\alpha p$ is obtained ($\bar{B}$ is a function quasistationary with time and B is a function introduced by Buleev). This high pressure system moves in the direction characterized by the field of line $\bar{B}$, which is computed by $\bar{B}=0.075\,B_{1000}+0.15\,B_{850}+0.175\,B_{700}+0.20\,B_{500}+0.15\,B_{350}+0.15\,B_{200}$. A simple equation for computing Π (potential energy) and examples of the cyclones in the direction of line $\bar{B}$ are presented. *Subject Headings:* **1. Cyclone movement 2. Hydro-thermodynamic concepts.**—*I.L.D.*

11.11–148 551.515.2:06

Arnett, A. B. (*U. S. W. B., Miami, Fla.*), **National Hurricane Research Project.** *Mariners Weather Log*, Wash., D. C., 3(4):115–118, July 1959. 2 figs., table. **DWB**—Activities and

results obtained during the 1956–1958 period are reviewed, including works of direct interest to marine navigation. This includes the Storm Surge Forecasting manual, sections of which are nearly completed for Texas, Connecticut and Rhode Island and partly for Florida and Virginia. The climatological and oceanographic atlas for mariners to be published this year is a compilation of charts featuring latitude and longitude squares (within 5°), % frequency of motion, and mean speed in all directions of tropical storms. Reconnaissance flights of the NHRP into the several hurricanes of 1956-1958 are tabulated. Scope and magnitude of the reorganized project is outlined. *Subject Headings:* **1. National Hurricane Research Project 2. Hurricane research.**—*W.N.*

11.11–149 551.511:551.515.23

Goda, I., [**Comments on**] **T. Fukaya: The relationship between vorticity tendency field and typhoon track, and** [**Reply**] **by Fukaya.** *Journal of Meteorological Research*, Tokyo, 10(2):156–157, Feb. **1958.** In Japanese. **DWB, DLC**—Questions raised are: Can one explain the central region of positive-negative motion in relation to the 24-hr variation of vorticity; direction of contour; phenomenon of relative divergence on the typhoon front line above 20–30°N lat.; the statement that "for good results on forecasting typhoon tracks, the vorticity of typhoon itself has to be neglected"; and storm circulation and its basis. FUKAYA replies that in the relation of positive-negative region of typhoon track and 24-hr tendency variation, the vorticity phenomenon above 20–30°N lat. had not shown much difference from the variation of the basic flow and the interrelation between rainfall intensity region and the relative divergence region were not found in his investigations. As Table 6 shows, in case of a strong typhoon, the forecasting of the typhoon track is difficult for two reasons: extremely difficult calculation of contours and the effect of the typhoon itself on the 24-hr track and on vorticity. The variation of vorticity in the stable basic pattern, however, is easy to show, but the influence of the basic westerly-wind can easily be shown to give good results for relative divergence. (For abstract on original, *see* 10.3–172, March 1959, *Met. Abs.*) *Subject Headings:* **1. Typhoon movement forecasting 2. Vorticity-typhoon track relationships 3. Vorticity in typhoons.**—*K.C.*

11.11–150 551.515.23:517.512.2

Smiley, Charles H. (*Ladd Obs., Brown Univ. Providence, R. I.*), **Poisson's law and the frequency of hurricanes.** *Nature*, London, 183(4664):814–815, March 21, **1959.** eqs. **DWB**—This theoretical discussion aims to show that if Poisson's law were not used because of the consecutive terms diminishing too rapidly, their ratio should be increased. This is demonstrated in the case of Z/n to Z first, and when applied to New England hurricane data yields $(1-Z)Z=3/80=0.0375$ and $Z=0.0390$. Next is shown $\frac{Z(1-Z)^2}{1-Z+Z^2}=0.0375$ and $Z=0.039095$. *Subject Headings:* **1. Hurricane frequencies 2. Poisson's Law.**—*W.N.*

11.11–151 551.515.21/4:061.3

†U. S. Weather Bureau, **Causes and characteristics of thunderstorms and other atmospheric disturbances.** 11th Interim Report, submitted in accordance with Public Law 657, 80th Congress. Wash., D. C., July **1959.** 41 p. 8 figs., 104 refs. (incl. 48 papers presented at Technical Conference on Hurricanes, Miami Beach, Nov. 1958). (For abstract on 10th Report, *see* 10B–174, Feb. 1959, *Met. Abs.*) **DWB** (M15.4 U587ia)—The present report is the Eleventh Interim Report, prepared in accordance with Public Law 657, 80th Congress. It reviews the annual progress in hurricane, tornado, and severe thunderstorm studies, with emphasis on the observational programs which are required for increased understanding of these phenomena. Aircraft equipped with special instrumentation were able to obtain an unusually large quantity of hurricane data during the year. The research studies based on these data are presented, together with plans for further work. Since the studies are incomplete, the present work is only in the nature of a progress report. Photograph and graphs, pertinent to the subject, illustrate the research studies. *Subject Headings:* **1. Hurricane research projects 2. Tornado research projects.**—*I.S.*

11.11–152 551.515.21:551.553:551.461.2

Ausman, Miriam, **Some computations of the inflow angle in hurricanes near the ocean surface.** Chicago. Univ. Dept. of Meteorology, Contract N605i-02036, Project NR-082-120, Report on Research [unnumbered], Sept. **1959.** 9 figs., table, 3 refs., eqs. **DWB** (M15.2 A932so)—Ship wind reports around six hurricanes in 1954 and 1955 were used to obtain the inflow angle in these storms as a function of distance from the storm center and the angular distance from the direction of storm motion. The mean inflow angle averaged around radius circles seemed to be unrelated to the radius of the circle used or to storm maturity. The size and location of the areas of outflow, however, were well-defined at constant values. Outflow took place in an area about 140 angular degrees wide and approximately centered on the direction of storm motion. *Subject Headings:* **1. Hurricane kinematics 2. Inflow angle in hurricane winds.**—*Author's abstract.*

11.11–153 551.515.23(529)

Report on typhoon "Billie." *Meteorological Bulletin*, Taipei, Formosa, 5(4):18–29, **1959.** figs., table, 30 eqs. In Chinese; English summary p. 18. **DWB, DLC**—Typhoon "Billie" stated to whirl about at the southeast of the Carolines on July 8, 1959. She increased her force up to the stage of a typhoon on the fourth day after her birth and reached a maximum wind velocity of 50 m/sec near the center on the morning of July 14. On the morning of July 15, the typhoon center passed between Penkiayu and Keelung. Later typhoon "Billie" traveled across the western part of the eastern China Sea and hit the coast of the China mainland on the morning of 16th. Its moving direction then shifted to the north. At her mature stage, the kinetic and potential energy of typhoon "Billie" was computed to a value 0.9×10^{24} ergs and 1.0×10^{25} ergs in comparison with the stage at noon of July 14. Some damage was reported along the route of the typhoon in the northern sectors of Taiwan. Twenty-one people lost their lives and more than four hundred houses were ruined. Highest wind velocity, recorded at Penkiayu, was 52.3 m/sec, and the maximum of total amount of rainfall, reported at Chutzehu, was 457.9 mm. *Subject Headings:* **1. Typhoon "Billie" (1959) 2. Formosa.**—*Author's abstract.*

11.11–154 551.515.23(529)

Report on Typhoon "Iris." *Meteorological Bulletin*, Taipei, Formosa, 5(4):30–34, **1959.** 5 figs., tables. In Chinese; English summary p. 30. **DWB, DLC**—Typhoon "Iris" first appeared on the synoptic chart of Aug. 18, 1959 and was located at 16°N and 127°E. Her intensity reached the stage of a typhoon at noon of Aug. 20. On the evening of Aug. 22, the typhoon center approached the southwestern coast of Taiwan at a distance of 60 km. Typhoon "Iris" then traveled across the southern part of the Taiwan channel, later hit the mainland of China on the morning of the 23d, and finally dissipated. Her kinetic and potential energy at her mature stage was calculated at about 1.6×10^{24} ergs and 1.7×10^{25} ergs respectively during the evening of Aug. 22. Damages reported along its passage, were mainly happened at the southwestern part of Taiwan. Eight men had lost their lives in the storm and more than three hundred houses had been ruined. The highest wind velocity recorded at Kaohsiung was 32.0 m/sec, and a maximum total amount of rainfall reported at dawn was 161.8 mm. *Subject Headings:* **1. Typhoon "Iris" (1959) 2. Formosa.**—*Author's abstract.*

11.11–155 551.515.23(262)

§Rodewald, M., **Eigenartiges Windspiel im westlichen Mittelmer.** [Unusual wind action in the western Mediterranean.] *Wetterlotse*, Hamburg, No. 131:105–113, June **1958.** 3 figs. **DWB**—Captain Kantzow of S/S "Erich" experienced what he thought was the track of a cyclone when en route Hamburg-Algiers. The shifting play of the elements is well illustrated in the ship's report for April 11–14, 1958 at 36°18′N, 2°45′W. The meteorological analysis of the situation reflects the gigantic features released by the cold air drops over a warmer ocean. *Subject Headings:* **1. Tropical cyclone tracks 2. Mediterranean.**—*W.N.*

11.11–156 551.515.23:656.6

Sewenig, K., **Bahnkreuzung vor dem Orkan-Zentrum.** [Crossing the path of a hurricane ahead of its center.] *Wetterlotse*, Hamburg, No. 136:209–211, Sept. **1958. DWB**—The

author, captain of M/S "Anita" which crossed the path of Hurricane "Carrie," Sept. 19 and 20, 1957, states why a repetition will be made in similar circumstances. Rather than lose more sea miles and time and still not be sure to navigate out of the path of the hurricane, a captain, knowing that ship and crew are good, will take the calculated risk of crossing. *Subject Headings:* **1. Hurricane "Carrie" (1957) 2. Navigation in hurricanes.**—*W.N.*

11.11–157 551.515.23(713)

§*Thomas, M. K. and Bruce, J. P., **Storm "Audrey" in Ontario, June 1957.** *Canada. Meteorological Branch, CIR*-2961, TEC-256, Aug. 22, **1957.** 13 p. 5 figs., 4 tables, 9 refs. **DWB**—The authors discuss the meteorological history of Hurricane "Audrey" (1957) which originated as a tropical depression over the Gulf of Mexico, including the various circulation features associated with its course across continental U. S. to Ontario, the precipitation in southern Ontario resulting from this hurricane, the depth area duration analysis of the storm rainfall, and the wind speeds. Data are presented on precipitation totals for Ontario for specified periods in June 1957, depth duration, maximum wind speeds during June 28–29, 1957 and mean frequency of tropical storms per month and mean monthly frequency of storms affecting Ontario. Also maps showing the path of the tropical storm "Audrey," the precipitation area in the U. S. and the rainfall in Ontario and Quebec are included. *Subject Headings:* **1. Hurricane "Audrey" (1957) 2. Hurricane tracks 3. Ontario.**—*I.L.D.*

11.11–158 551.515.23:551.582.3

Typhoon tracks 1957. *Mariners Weather Log*, Wash., D. C., 2(5):152, Sept. **1958.** 5 figs., 2 tables. **DWB**—The brief text is accompanied by tables including 18 typhoons listed alphabetically in the Western Pacific style, from "Rose" through "Mamie." Plottings of tracks for the periods Jan.–June, July–Aug., Sept., Oct. and Nov. 1957 are featured on individual maps. The observations were conducted by the U. S. Navy Fleet, Weather Central, Guam. *Subject Headings:* **1. Typhoon tracks 2. Typhoon charts 3. Western Pacific.**—*W.N.*

11.11–159 551.515.4:551.511.1(52)

Ohsawa, K. (*Nagasaki Marine Obs.*), **Instability line with thunderstorm.** *Meteorological Society of Japan, Tokyo, Journal*, Ser. 2, 36(6):227–238, Dec. **1958.** 14 figs., 12 refs. **DWB, DLC.** Reprinted as: *Oceanography and Meteorology*, Nagasaki, Japan, 9(179), **1959.**—Some features of the instability lines which form over the Tsushima Warm Current are studied with some examples. The gust over the seas west of Kyusyu which suddenly blows over the calm sea surface from winter to early spring causing many casualties, proved to be a thunderstorm phenomenon with an instability line. Heavy rains in small areas in a short period of time in summer and tornadoes in every season, are also frequently accompanied by instability lines with thunderstorm. These instability lines in Japan resemble very closely those in the U. S. Some notes of instability lines in Japan are presented. *Subject Headings:* **1. Instability line 2. Thunderstorms 3. Japan.**—*Author's abstract.*

11.11–160 551.515.73:551.557:551.542.1

Luzhnaia, N. P., **K voprosu o peremeshchenii antitsiklonov.** [The movement of anticyclones.] *Meteorologiia i Gidrologiia*, Leningrad, No. 7:14–20, July **1959.** fig., 5 tables, 3 refs. **DWB, DLC**—General rules on forecasting of movements of basic formations near the ground are discussed with consideration of the effect of steering currents and especially movements of baric centers. In 75% of the cases of 546 observations. the anticyclones deviate from the direction of the geostrophic winds in the troposphere above anticyclonic centers. Basic observations and computation of coefficient "K" (ratio of velocity of movement of anticyclones to velocity of geostrophic wind above its center) are given. Average value of "K" often leads to considerable errors in forecasting the velocity of anticyclone movements, unless the causes of deviation in "K" are studied in advance. Variations of value "K" with the velocity of geostrophic wind above its center are tabulated and their relations are discussed with details and consideration of changes in air temperatures along the stream above. Frequency of front and rear parts of the anticyclone at different isobaric surfaces (levels) "S," frequency of "S" at different levels and distribution of "K" in relation to "S" are given in

tables. Frequency of deviation between 170 forecasts and actual positions of the centers of the anticyclones along isoline B and along isohypses at AT_{700} are given. Advantages of 4 methods of forecasting are analyzed in the text. *Subject Headings:* **1. Anticyclone movement forecasting 2. Geostrophic winds.**—*N.P.S.*

11.11–161 551.515.8:551.578.7(443.8)

Jalu, R., **Orage et chute de grêle du 11 août 1958 à Strasbourg.** [Thunder and hailstorm of Aug. 11, 1958, at Strasbourg.] *La Météorologie*, Paris, Ser. 4, No. 55:209–220, July/Sept. **1959.** 4 figs., photo, 9 refs. French, English and Spanish summaries. **DWB**—On Aug. 11, 1958, a thunderstorm with severe hail shower raged over the Strasbourg region. This hail shower was quite exceptional because of the size of the hailstones and the extent of the damage. A short survey of the region affected, the character of the hailstones (shape, size, weight), the importance and nature of the damage are given. The study is principally devoted to an analysis of the meteorological and aerological situation in order to determine the causes of the phenomenon. The stormy situation of Aug. 11, 1958 is a clear example of the formation of a line of instability even inside a warm sector, much ahead of a cold front. A nonadvective nucleus of "high" forms in the zone of precipitation ("meso-high"); the sudden variations of pressure and temperature are connected with the cooling of air masses descending under the action of precipitation. The isobaric and isallobaric gradients are considerably reinforced by an initial condition of barometric tides. The pressure jumps of this thunderstorm were recorded in most of the weather stations in eastern France; the rise in pressure varied from 2 to 7.5 mb according to the region, the relative humidity increased by 12% to 49% and a fall of 3° to 9°C was observed in temperature. *Subject Headings:* **1. Hailstorm, Strasbourg (Aug. 11, 1958) 2. Hailstorm analysis 3. Instability line 4. Hailstone size 5. Hail damage 6. Strasbourg, France.**—*A.V.*

11.11–162 551.509.311:551.515.8(798.4)

Koppány, Győrgy, **Alaszka téreségeből kiindulő hidegfrontok hatása Közép-Európa időjárására.** [Effect of cold fronts originating in the region of Alaska upon weather in Central Europe.] *Időjárás*, Budapest, 63(5):307, Sept./Oct. **1959.** ref. **DLC**—The changes in the macrosynoptic conditions cannot always be explained by the dispersion of the existing air mass. The unexpected weather conditions in Central Europe in certain cases are connected with sudden and heavy changes in Alaska, destroying the stationary anticyclone which determines the weather of this territory. This fact should be considered in the 14-day weather forecasts. *Subject Heading:* **1. Cold front forecasting.**—*E.K.*

11.11–163 551.509.31:551.515.8:551.576.2:551.577.1(497.2)

Martinov, M., **Evoliutsiia na oblachnostta i valezhite po topli frontove nad Balkanskiia poluostrov i po-spetsialno nad Bŭlgariia.** [Development of cloudiness and precipitation along warm fronts over the Balkan peninsula and over Bulgaria in particular.] *Khidrologiia i Meteorologiia*, Sofia, No. 3:31–44, **1959.** 2 figs., 7 refs. Russian and English summaries p. 43. **DLC**—The present paper indicates certain peculiarities in the transfer and evolution of warm fronts over the Balkan peninsula and over Bulgaria in particular. In view of genesis and development the warm fronts are divided into three groups: 1) warm fronts connected with southern (chiefly Mediterranean) cyclones moving slowly and stopping along the southern border or over the territory of the country; 2) warm fronts connected with southern cyclones moving fast, while the country falls completely in the warm section of the cyclone; and 3) warm fronts connected with non-Mediterranean cyclones. On the basis of a synoptic-aerological analysis of 47 cases of warm fronts of the three types during the period under review (1953–1957) the factors which lead to frontogenesis and substantial precipitation over the Balkan peninsula and over Bulgaria are pointed out. The differences in the distribution of precipitation over the country are indicated and explanations are given, which, in broad lines, are reduced to proximity to the cyclone and the role of orography outside and over the territory of Bulgaria. *Subject Headings:* **1. Warm front analysis 2. Synoptic analysis of warm fronts 3. Warm front effects 4. Balkan Peninsula.**—*Author's abstract.*

11.11–164 551.509.31:551.515.8:551.577:551.575(477)

*Mishutin, D. A., **Nekotorye dannye ob atmosfernykh frontakh stepnoi chasti Ukrainy.** [Some data on atmospheric fronts in the Ukrainian steppe regions.] *Kiev. Ukraine. Nauchno-Issledovatel'skii Institut. Trudy*, No. 5:225–228. 1956. 4 tables. **DWB, DLC**—The data taken from daily synoptic charts kept in the Leningrad Weather Bureau for the period 1936–1948 give information on the mean monthly number of days with a frontal weather regime, the mean monthly duration of the passage of cold and warm fronts over the steppe regions, the mean monthly amounts of frontal precipitation in Dnepropetrovsk Region for 1936–1940, and the probability of fog during the passage of cold and warm fronts over the same region. All the information is presented in tables and is discussed. *Subject Headings:* **1. Frontal analysis 2. Frontal effects on fog forecasting 3. Frontal type precipitation 4. Ukrainian S.S.R.**—*A.M.P.*

11.11–165 551.509.318:551.515.8:523.4

Ped', D. A. and Fedulova, M. N., **Povtoriaemost' planetarnykh vysotnykh frontal'nykh zon estestvennykh sinopticheskikh periodov.** [Frequency of planetary upper frontal zones of natural synoptic periods.] *Meteorologiia i Gidrologiia*, Leningrad, No. 8:11–16, Aug. 1958. 3 figs., 2 tables, 14 refs. **DWB, DLC**—This study of the frequency of the geographic positions and the intensity of the planetary frontal zones aloft in January and June on the basis of the mean data of AT_{500} natural synoptic periods is based upon an analysis of 48 natural synoptic periods in January and 47 in July during 1949–1959. The position and intensity of the planetary frontal zone aloft was determined for the Northern Hemisphere between 30°W long. and 78°E long. Maps with the axial lines of the planetary frontal zone aloft were constructed: a central axial isohypse of the zone of maximum geopotential gradient on the AT_{500} natural synoptic period was taken as the axial line of the planetary frontal zone aloft. The position of the planetary frontal zone aloft is characterized in January by the axial isohypse of 532 decameters and in July by that of 564 decameters. The mean position of the planetary frontal zone aloft in January and July oscillates around 50°N lat.; but the eastern half in July takes up a more northerly and the western a more southerly position than in January. The extreme limits of the planetary frontal zone aloft in January are between 40°–72°N lat. and in July between 44°–76°N lat. In January it experiences the least oscillation over the eastern regions of the North Atlantic, Eastern Siberia and Kazakhstan and the maximum oscillation between 0°–30°E long. In July it experiences considerable oscillation over this entire territory except in the eastern parts of the North Atlantic. The amplitudes of the deviation of the position of the planetary frontal zone aloft are very large in January and June although the frequency of large deviations is small. The intensity of the planetary frontal zone aloft is on the average greater in January than in July. *Subject Headings:* **1. Planetary frontal zone aloft 2. Natural synoptic periods 3. Frontal zone variations.**—*I.L.D.*

11.11–166 551.515.81:551.588.2(497.1,434.3)

Petkovšek, Zdravko, **Der Einfluss der Alpen auf die Kaltfront-Bewegungen.** [Influence of the Alps on cold front movements.] *Germany. Deutscher Wetterdienst, Berichte*, 8(54):246–253. 1959. 8 figs., 5 tables, 12 refs., 11 eqs. German and English summaries p. 246. **DWB, DLC**—The kinematics of the cold fronts within the range of the Alps has been studied on the basis of 67 cold fronts that influenced the weather in Slovenia in the year 1957. The treatment is based on especially determined positions of fronts, using surface maps. Almost all cold fronts that crossed Slovenia came over the Alps. There occurred deformations and changes of the direction and speed of their movement, the quantitative values of which are determined and given in a rather peculiar way. Then one can follow the consequences of these changes, first of all the retardation of the fronts in the regions behind the Alps. Positional speeds of cold fronts coming from various directions, however, are discussed only qualitatively. *Subject Headings:* **1. Cold front movement 2. Orographic effects on cold fronts 3. Slovenia 4. Alps.** —*Author's abstract.*

11.11–167 551.515.83:551.465(261)

Whiting, Georgia C. (*Natl. Wea. Records Center, U. S. W. B., Asheville, N. C.*), **Frontal passages over the North Atlantic Ocean.** *Monthly Weather Review*, Wash., D. C., 87(11):409–

416, Nov. 1959. 7 figs., 4 tables, 16 refs. **DWB, DLC**—Graphical and tabular data on the frequency of frontal passages at Ocean Station Vessels on the North Atlantic are compiled from historical weather maps for the years 1945–57. The stabilizing influence of the Gulf Stream is shown by the rapid modification of air temperature at all stations and by the rapid transition of frontal systems. The greatest frequency of fronts is found at the line of initial contact of cooler air with that associated with the Gulf Stream in the westermost region of the ocean. The value of the historical sea level synoptic weather maps as a data source for the climatological study of atmospheric motion systems is emphasized. *Subject Headings:* **1. Frontal frequencies 2. Gulf Stream effects on frontal passage 3. North Atlantic.** —*Author's abstract.*

RADIATION AND TEMPERATURE

RADIATION

See also: **Van Allen belt** (Bilancini), 11.11–77; **Radiation effects on satellites** (Parkinson et al.), 11.11–96; **Radiation absorption by glaciers** (Ambach, Mocker), 11.11–106; **Radiation errors of radiosondes** (Perlat), 11.11–109; **Radiation effects on snow melt** (Onufrienko), 11.11–126; **Heat and moisture balance** (Grigor'ev), 11.11–130; *see also* bibliog on **Airglow**, p. 1845.

11.11–168 551.521

Elovskikh, M. P. and Kondrat'ev, K. Ia. **Uglovoe raspredelenie intensivnosti teplovogo izlucheniia atmosfery.** [Angular distribution of intensity of heat radiation of the atmosphere.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 5:683–688, May **1957.** 5 figs., 2 tables, 4 refs., 6 eqs. **DLC**—The authors present the results of new and more complete investigations of the distribution of the intensity (energetic brightness) of the effective radiation and counter radiation of the atmosphere to the sky. Data are presented on the angular distribution of the intensity of effective radiation and counter radiation of the atmosphere for a clear sky and on effective radiation for a cloudy sky. *Subject Headings:* **1. Effective radiation 2. Radiation intensities.**—*I.L.D.*

11.11–169 551.521:001.4 551.508.21

La Toison, M., **Tour d'horizon de l'infra-rouge à l'ultra-violet.** [General survey from infrared to ultraviolet.] *Electronique Industrielle*, Paris, No. 31:39–44; 52, Feb. **1960.** 24 figs.—Before undertaking the study of radiation with respect to its practical application, the author recalls the aims and operational principles of the principal instruments used in spectroscopy: spectrophotometers and spectrographs. In Pt. II he deals with thermal and photoelectrical receivers: bolometer, thermopiles, radiameters, luxmeters, etc. Pt. 3 is a short account of energetic photometry: radiation sources, ultraviolet, visible and infrared. Several definitions are a worthwhile contribution to radiation terminology. *Subject Headings:* **1. Radiation terminology 2. Radiation instruments.**—*A.V.*

11.11–170 551.521.1(791)

*Caryl, C. R. and Leeper, G. A. (*both, Desert Sunshine Exposure Tests, 7740 N. 15th Ave., Phoenix, Ariz.*), **Measurement of solar radiation in Phoenix.** *Solar Energy*, Phoenix, Ariz., 3(1):59, Jan. **1959.** 2 tables, 2 refs. **DWB**—Tabulated data of radiation during 1954–1958 are presented in daily averages measured on a horizontal plane, 45° inclined plane and on an equatorial mount; another table gives the same data by months in 1957 for comparison. *Subject Headings:* **1. Solar radiation data 2. Diurnal global radiation 3. Phoenix, Ariz.**—*W.N.*

11.11–171 551.521.1:621.47

*†Masson, H. (*Univ. of Dakar, Faculty of Sci.*), **La conversion de l'énergie solaire.** [Conversion of solar energy.] Vesoul, France, Marcel Bon, (**1958?**). 40 p. 33 figs., 46 refs. French summary p. 1. **DWB** (M21.1 1719co). Also issued in: *Acta Electronica*, Paris, 3(2):103–142, April **1959.** 33 figs., tables, 46 refs., 4 eqs. French summary p. 103. German summary p. 190. **DLC**—A sizeable monograph reviewing the history of solar energy utiliza-

tion, the importance of humanity, the nature of solar radiation, methods of measurement, factors influencing radiation (atmospheric absorption, cloud cover and type, orientation), natural processes of conversion (evaporation, wind, photosynthesis), artificial means of conversion (mirrors, distilleries, cookers, drying, domestic water heaters, dwelling heating and cooling, refrigerators, climatic control, heat pumps, motors, sea heat use, chemical, electrical and other types of conversion). Detailed drawings show types of equipment. Theory is expounded and performance curves presented. *Subject Heading:* **1. Solar energy utilization.** —*M.R.*

11.11–172 551.521.1:551.524.32:551.526.6:551.326.8:639.2

†Needham, Paul R. and Jones, Albert C. (*both, Univ. of Calif., Berkeley*), **Flow, temperature, solar radiation, and ice in relation to activities of fishes in Sagehen Creek, California.** *Ecology*, Durham, N. C., 40(3):465–474, July **1959.** 5 figs., table, 22 refs. **DWB, DLC** —The authors investigated the effect of severe winters upon the mortality of fish in Sagehen Creek, Calif. The methods for making observations of air and water temperatures by means of thermocouple stations, of solar radiation with a flat plate radiometer (Gier and Dunkle) and water levels is described. The seasonal characteristics of air and water temperature, the diurnal cycles in air and water temperatures and solar radiation are described with the aid of graphs of monthly mean maximum and minimum air and water temperatures for 1953 and 1954 and 24 hour records of water temperature, ground temperature and radiation. It was found that two periods of acclimation to temperature exist, one in the fall and one in the spring. These prepare fish for both low water temperature of winter and the high temperature of summer. Water temperatures show less fluctuation in winter than in summer both because of the smaller amount of net radiation and the storing of heat as latent heat of fusion during ice formation. Bottom macrofauna was abundant for trout in winter and they were observed to feed when the water temperature was between 32° and 33°F. Since 32°F is within the zone of tolerance of trout and trout are able to resist water temperature below 32°F for short periods of time. Anchor ice is an important ecological factor, since it raises the water level in pools and reduces the flow over rills. Anchor ice formed only in those areas of the stream which had no upwelling of relatively warm ground water through the substratum. The higher winter mortalities of trout population are not the result of lack of food or long periods of low temperature. More likely causes are sudden catastrophes, such as severe floods or suffocation under collapsed snow banks or dewatering of stream sections by ice dams. *Subject Headings:* **1. Solar radiation measurements 2. Temperature variations 3. Water temperature variations 4. Fisheries research 5. Sagehen Creek, Calif.**—*Authors' summary & I.L.D.*

11.11–173 551.521.1:551.521.31(437.6)

*Smolen, František, **Slnečné žiarenie v Bratislave v apríli 1955; porovnanie výsledkov HMÚ a laboratória pre meteorológiu a klimatológiu PFUK.** [Solar radiation in April 1955: comparison of the results of the Hydrometeorological Institute and the Laboratory for Meteorology and Climatology, Dept. of Natural Sciences, Bratislava University.] *Meteorologické Zprávy*, Prague, 12(2/3):41–47, **1959.** 6 figs., 14 tables, 8 refs. **DWB, DLC**—Direct solar radiation data for two stations situated at different elevations in Bratislava are compared in tabular and graphical form. Data on red and infrared radiation ($\lambda > 0.625\mu$) and on the effect of turbidity are included. The measurements were made in April 1955. *Subject Headings:* **1. Direct solar radiation intensities 2. Solar radiation data 3. Turbidity 4. Bratislava, Czechoslovakia.**—*G.T.*

11.11–174 551.586:551.521.17:577.4

Dantsig, N. M., **Soveshchanie po biologicheskomu deistviio ul'trafioletovogo izlucheniia.** [The symposium on the biological action of ultraviolet radiation.] *Gigiena i Sanitariia*, Moscow, 24(1):86–87, Jan. **1959. DLC**—A report on the proceedings of the sixth regular symposium on the "Biological Action of UV Radiation" held in Leningrad during June 2–6, 1958 under the auspices of the Institute of Biological Physics of the Academy of Sciences of the U.S.S.R. and other scientific institutions. The papers delivered, some of which are summarized, fall into three groups, viz: (1) biological mechanism of the action of UV radiation, including protein metabolism, immuno-biological reaction, blood serum, etc; (2) use of UV

solar radiation and artificial UV radiation in medicine and agriculture, and (3) UV lamps and methods of using UV radiation. Also the methods of measuring natural and artificial UV radiation were discussed. *Subject Headings:* **1. Biological effects of ultraviolet radiation 2. Biometeorology.**—*I.L.D.*

11.11–175 551.521.17(98)

Ponomarev, L. E., **Gigienicheskaia otsenka i prakticheskoe ispol'zovanie ul'trafioletovoĭ radiatsii solntsa i nebosvoda v raĭone severnogo poliusa.** [Hygienic evaluation and practical use of ultraviolet radiation of the sun and sky in the region of the North Pole.] *Gigiena i Sanitariia*, Moscow, 22(8):69–70, Aug. **1957.** table. **DLC**—Ultraviolet radiation measurements made near the North Pole (82–83°N lat.) during the summer period (July–September) of the 1955 "Severnyĭ Polius" Expedition are reported. The measurements were made by means of a photochemical oxalic acid process. Maximum theoretical total monthly ultraviolet radiation is 1052.2 mg/cm² of oxalic acid equivalent for July and 826.6 for August. Actual values were considerably lower (the highest daily value, on July 31, was 35.04 mg/cm²). Diffuse ultraviolet radiation was found to be 80% of the total ultraviolet radiation on clear days, due to the high reflectivity of the ground surface. *Subject Headings:* **1. Ultraviolet radiation measurements 2. North Pole.**—*G.T.*

11.11–176 535.33:551.521.18

Tingwaldt, Carl P. (*Physikalisch-Technische Bundesanstalt, Braunschweig, Germany*), **Measurement of spectral sensitivity in the infra-red.** (In: Conference on the Use of Solar Energy, Univ. of Arizona, 1955, **Transactions,** pub. **1958.** Vol. 2:57–61. 2 figs., 3 refs.) **DWB**—A simple glass arrangement for measuring the reflectivities of solid bodies in the infrared, from wave length 2 to 10 microns, is described. A water-cooled sample is inserted in a glass hohlraum, the temperature being held at the boiling point of sulphur (444.6°C). Some preliminary results of platinum, copper, and a black film made from gold are presented. *Subject Headings:* **1. Infrared spectra 2. Infrared radiation measurement techniques.**—*Author's abstract.*

11.11–177 551.521.3

Curcio, J. A. and Durbin, K. A., **Atmospheric transmission in the visible region.** *U. S. Naval Research Laboratory, NRL Report*, 5368, Oct. 6, **1959.** 27 p. 20 figs., 2 tables, 12 refs., eqs. **DWB** (M(055) U586r)—Atmospheric transmission measurements have been made over a period of one year at Washington, D. C., White Sands, New Mexico, and the east coast of Florida. Attenuation coefficients have been determined at three wave lengths (4700A, 5350A, and 6650A) by the Koschmieder contrast relationship, from about 300 sets of visual observations. Measurements were made through a variety of weather conditions including rain, drizzle, snow and various degrees of haziness. The meteorological range varied from 1.5 to 120 km at a temperature range of 17° to 96°F and the relative humidity varied from 16 to 99%. Analysis of the data for the three wave lengths shows that within limits of ±15% the following relationship exists for all experimental conditions other than drizzle or rain: attenuation coefficient ~ (wave length)$^{-1.3}$. The White Sands and Florida data are relatively small in number but appear to be similar to the Washington results. The foregoing relationship is in agreement with the particle size distribution function, $dN/d \log r = cr^{-3}$, observed experimentally by JUNGE. The particle size distribution appears to be independent of relative humidity and attenuation coefficient. *Subject Headings:* **1. Atmospheric transmission coefficients 2. United States.**—*Authors' abstract.*

11.11–178 551.521.3:551.594.13

Lorents, Donald and Cook, Charles J., **A feasibility study: scattering of electrons by ions, atoms, and molecules.** Stanford Research Institute, Menlo Park, California, Contract AF 19(604)-3475, Scientific Report, No. 2, Sept. 17, **1959.** 21 p. 4 figs., 22 refs., eqs. **DWB**—The experimental determination of electron differential scattering cross sections is considered in the light of recently developed experimental techniques. A high intensity ion source operated in conjunction with a charge exchange cell can provide, in the form of a fast (0.1 to 5.0 kev) beam, a large variety of scattering media. The density of such beams is low

but the use of modern vacuum techniques together with modulation of both the atom beam and the electron beam allows selection of desired scattering events from a host of background events. Low dispersion electron beams with energies down to 1 ev obtained from an SRI-developed electron gun will allow detailed investigation of the low energy region. A measurement of the differential elastic scattering cross section of 1 to 10 ev electrons from atomic oxygen and nitrogen appears feasible with these techniques. The techniques should be applicable to the study of a broad field of low energy electron interactions with atomic systems. *Subject Heading:* **1. Electron scattering.**—*Authors' abstract.* ®

11.11–179 551.510:551.521.64/67:551.586:616

Schulze, Rudolf (*Hamburg*), **Die Atmosphäre als Strahlenfilter, als Strahlenquelle und als Träger strahlender Substanzen.** [The atmosphere as a radiation filter, source of radiation and carrier of radiating substances.] *Annalen der Meteorologie, Medizin-Meteorologische Hefte*, No. 13:127-141, **1958.** 11 figs., 3 tables. **DWB**—A review of the physical properties of the various types of radiation, their intensity and variation and of their effect upon man. The discussion includes the following: the role of the atmosphere as a filter of corpuscular and cosmic radiation acting both as an atom reactor and an X-ray tube for the atmosphere; its penetrability by medium and long wave ultraviolet radiation and short wave infrared radiation; the biological effects of corpuscular, cosmic, gamma ray and X-ray radiation, especially upon mutation rate; the destructive action of medium wave ultraviolet radiation with increasing wave length upon plant and animal tissue, and the constructive effect of medium ultraviolet radiation such as the production of Vitamin D, etc.; solar radiation intensity at the earth's surface, the ultra-high frequency radiation, namely the continuous electromagnetic radiation in the wave length region of a few centimeters to more than 100 m which has an intensity of 10^{-9} W/m^2 and their possible biological influence; the atmosphere as a source of infrared radiation in the region of 6μ–60μ, which plays a role in thermal balance of warm blooded animals; the high frequency radiation which is electromagnetic in character and is associated with atmospheric motions at fronts, etc., and the role of the atmosphere as carrier of radiating substances including natural and artificial radioactivity of the atmosphere. *Subject Headings:* **1. Radiation intensities 2. Radiation filtration by atmosphere 3. Cosmic radiation 4. Ultraviolet radiation 5. Infrared radiation 6. Biological effects of radiation.**—*I.L.D.*

TEMPERATURE

See also: **Record low temps., Antarctica** (Zikeev), 11.11–22; **Ionospheric temp. equalization** (Johnson), 11.11–53; **Temp. calculations** (Cehak), 11.11–103; **Upper air temps., Arctic** (Orvig), 11.11–119; **Superadiabatic temp. profiles** (Priestley), 11.11–137; **Temp. for fisheries research** (Needham, Jones), 11.11–172; **Heat exchange in reservoirs** (Nesina), 11.11–195; **Cold waves, Alaska** (Williams), 11.11–213; **Upper air temp. measurement** (Mordukhovich), 11.11–280.

11.11–180 551.524:551.326.4(210.5)(485)

*Rodhe, Bertil, **Z-värden isvintrarna 1921/22–1957/58: en temperaturfunktion for systematisering av isforhallandena utanfor svenska kusten.** [Z-values of the ice winters 1921/22-1957/58: a temperature function for systematization of the ice conditions along the Swedish coast.] *Sweden. Meteorologiska och Hydrologiska Institut. Meteorologiska Byran, Notiser och Preliminara Rapporter*, 2(1), **1959.** 12 p. 10 charts, numerous tables, 6 eqs. **DWB** (M(055) S974no)—In preceding papers the author defined and discussed the qualities of the T-series and the Z values, the latter as a function of the temperature and the time. In the present paper is given a brief discussion of the T-series followed by elaborate tables and Z-curves. The main tables feature the Z-values for 9 Swedish stations distributed along the entire Swedish coast and selected because of temperature conditions influenced by the ocean. In general, conditions for ice formation along the entire Swedish coast at $Z=10$–15 days within sheltered bays, interior archipelago 15–25 days, exterior 30–40 days. Farther out, new ice forms at $Z=35$–50 days, off-coast open sea 50–60 days. Navigation suffers where Z exceeds 70 days. *Subject Headings:* **1. Oceanic effects on temperature 2. Ice conditions along Swedish coast 3. Temperature data 4. Sweden.**—*W.N.*

11.11–181 551.524.2:551.513 551.5:551.46:92

Model, F., **Alexander von Humboldts Isothermen.** [Alexander von Humboldt's isotherms.] *Deutsche Hydrographische Zeitschrift*, Hamburg, 12(1):29–33, **1959.** 9 refs. **DWB**—In his memoir **Des lignes isothermes et de la distribution de la chaleur sur le globe** (1817), VON HUMBOLDT drew the first isotherms which were lines of separation between zones having specified temperature ranges (by 5° intervals). With these lines VON HUMBOLDT proved that the global temperature distribution does not strictly follow the geographic latitude and that the general atmospheric circulation rather than local factors, must be responsible for this discrepancy. VON HUMBOLDT also constructed the first meridional atmospheric cross section. The importance of VON HUMBOLDT'S work in meteorology and oceanography, and the history of his work in those fields are reviewed. *Subject Headings:* **1. Isothermal charts 2. General circulation 3. Oceanography 4. Humboldt, Alexander von 5. Historical weather maps.**—*G.T.*

11.11–182 551.524.36(573)

Rubinshteĭn, E. S., **K voprosu o poliusakh kholoda.** [The question of cold poles.] *Meteorologiia i Gidrologiia*, Leningrad, No. 12:28–30, Dec. **1958.** 2 tables. **DLC**—The reported minimum air temperature of −69.8°C at Verkhoiansk is actually a reading of −67.8° made with an alcohol thermometer corrected by −2° so as to obtain the centigrade value. Temperatures of −66.8°C and −67.7°C have been observed at Oimyakon. During the past 26 years the mean minimum temperature at Oimyakon has been 3.9°C lower than at Verkhoiansk; absolute minima of temperature of −69° and −70°C are observed in cold years on the Nera River while these low temperatures occur east of the Lena River, very low absolute minima have been observed in Central Siberia, in Kochumdek on the Lower Tunguska it is possible to expect minima of −69°C. The possible cause of such low temperatures in Eastern Siberia is the cooling of the earth's surface and the lower layers of the atmosphere in concave relief during stable anticyclone weather. *Subject Headings:* **1. Cold pole, Siberia 2. Eastern Siberia.**—*I.L.D.*

11.11–183 551.509.318:551.524.37(47)

*Kremenskaia, N. L. and Nikitenko, S. F., **Vesennie i osennie zamorozki v Kurskoĭ i Belgorodskoĭ oblastiakh.** [Spring and autumn frosts in the Kursk and Belgorod areas.] *Sbornik Rabot po Sinoptike*, Moscow, No. 3:25–42, **1959.** 8 figs., 11 tables, 9 refs., 2 eqs. **DWB**—On the basis of data for the period 1945–1956, the authors present data (in the form of tables and isolines) on the mean dates of the last spring frost, mean dates of the first fall frost, number of days with frost in Kursk and Belgorod areas in May and October, distribution of number of days with frost by years and by pentads, distribution of duration of frosts in days, frequency of frosts of different intensity distribution of natural synoptic periods with frosts by years, etc. The synoptic conditions associated with the occurrence of frosts are discussed. The frosts in Kursk and Belgorod areas were investigated by analyzing the circulation index in the area between 44° and 68°N lat. and 6° and 46°W long. The circulation index was computed by

$$I_{\lambda N} = \frac{b \sum_{1}^{i=1} k\varphi m_{SN}}{(\lambda_i - \lambda_1)(j-1)} \; dkm/1°eq$$

and the values of the circulation index before the incidence of frost in May, in the third decade of September, the critical values of the indices for frost incidence, verification of conditions of frost forecasts and the values of meridionality indices in May 1952 are presented in tables. The procedure for forecasting frost with the aid of the circulation index is outlined and specific examples are presented. *Subject Headings:* **1. Synoptic conditions for frost 2. Spring frosts 3. Autumn frosts 4. Kursk Oblast, U.S.S.R.**—*I.L.D.*

11.11–184 551.524.371:551.509.612:634

Dinkelacker, O. and Aichele, H., **Frostbekämpfung im Wein- und Obstbau.** [Frost prevention in wine and fruit growing.] *Umschau*, 59(8):241–244, April **1959.** 7 figs. **DLC**—

In this discussion of various measures of frost prevention the authors consider the use of tree or shrub row plantings above frost threatened crops to hinder the flow of cold air at the ground or to divert it, in case of radiation frost; the covering of plants by means of branches and leaves cloth, paper, plastic sheets, the production of smoke or fog covers by burning damp straw frost protection by heating with briquettes or oil, central oil heating, the use of wind machines by sucking air from higher levels downward to plant height and sprinkling. Comparative costs are considered with the aid of specific examples and efficiency of the various techniques are compared in respect to temperatures used and amount of warming attainable. *Subject Headings:* **1. Frost damage to orchards 2. Frost prevention 3. Fruit culture.**—*I.L.D.*

11.11–185 551.524.371:551.509.612:634

Brooks, F. A. and Schultz, Herbert B. (*both, Univ. of Calif.*), **Orchard heating effectiveness** *California Agriculture*, Berkeley, Calif., 12(8):4–5, 13, Aug. **1958.** 5 figs., table. **DWB**— The cost of orchard frost protection particularly for citrus and deciduous fruit growers has been considerably reduced by the use of blowers —wind machines—according to a study report given at the 15th International Horticulture Congress in Nice, France. In case of citrus an examination of the average hourly temperatures for 15 nights of frost shows a horizontal as well as vertical difference because of dense foliage. Horizontal differences are not found in deciduous orchards with nearly bare branches. It is held that heating effectiveness depends on the strength of the inversion, and increases with the size of the area heated. Studies of heating effectiveness were not made. It is suggested that combination of heaters and machine, also photographically illustrated, is the best course. The advantage is that the machine often gives adequate protection for the whole night and the heater hours of support generally amount to less than one sixth those needed without the machine. Five figures illustrate the study. *Subject Headings:* **1. Frost damage to orchards 2. Orchard heating 3. Fruit culture.**—*I.S.*

11.11–186 551.524.371:551.509.612:632.111.5

Primault, Bernard, **Etude microclimatologique en vue de la protection d'un verger contre le gel.** [Microclimatological study in relation to the protection of an orchard against frost.] *Geofisica e Meteorologia*, Genoa, 7(3/4):67–74, May/Aug. **1959.** 12 figs., 3 tables, ref. French and English summaries p. 74. **DWB**—In many lands yearly frost damage to orchards is very important. In his article the author examines to what extent California heaters may save fruit crops. After having examined the natural microclimatological conditions of an orchard under strong radiation, he compares them with those to be found when the heaters are in action. Heaters can raise the temperature by 1.5°C. With this method it is possible to protect the plants against light and moderate frosts, however no security can be given in case of strong frosts. *Subject Headings:* **1. Frost damage to orchards 2. Frost protection 3. Orchard heating.**—*Author's abstract.*

11.11–187 551.524.4:551.551.25:551.510.42:628.53

Smith, M. E.; Singer, I. A. et al. (*all, Brookhaven Natl. Lab., Upton, Long Island, N. Y.*) **The variation of effluent concentrations during temperature inversions.** *Air Pollution Control Association, Proceedings*, Vol. 50, **1957.** Issued **1958?** Paper No. 19 (5 p.). 3 figs., 2 tables, 6 refs., 2 eqs. **DWB** (M10.42 A298ap)—The first set of inversion concentration data obtained at Brookhaven from the 355 ft test stack facility has been presented and analyzed. The data, though scanty, reveal that diffusion within the first mile from the source agrees with the pattern suggested by BARAD, in which an initial aerodynamic diffusion process is followed by a very gradual, natural one. However, it is somewhat surprising to find that the initial diffusion is much more rapid than had been anticipated, and also that the subsequent natural process is more gradual. Accurate prediction of the inversion diffusion concentrations is made difficult by the marked, 2-stage nature of the plume behavior. Little enough is known of the natural rates of diffusion, but even if that process could be described precisely, errors amounting to factors of 10 to 1000 may be introduced by neglect of the initial dilution. Discrepancies of this order are too large to be acceptable for many purposes, and careful investigation of effluent plumes close to the stack is a prerequisite to improvement of the estimates. (Run from another source as 10.6–210, June 1959, *Met. Abstracts.*) *Subject Headings:* **1. Temperature inversions 2. Stack effluents diffusion. I. Bartlett, F. E. II. Marcus, L.**—*Authors' abstract*

11.11–188 551.524.4:551.571.4:551.511.13

Yamamoto, Giichi and Kondô, Junsei (*both, Geophysical Inst., Faculty of Sci., Tohoku Univ.*), **Effect of surface reflectivity for long wave radiation on temperature profiles near the bare soil surface.** *Tohoku Univ., Science Reports, 5th Ser., Geophysics*, 11(1):1–9, Sept. **1959.** 7 figs., 9 refs., 3 eqs. **DWB, DLC**—Temperature and humidity profiles were observed over a bare soil surface during daytime and nighttime. It was shown that the observed temperature profiles differ from those predicted by turbulent transfer theory in the lowest layers of about 10–20 cm from the surface, even in daytime and especially on clear nights, although it was not calm in the observed periods. The observed temperature profiles and the observed temperature changes are explained, at least qualitatively, by considering the effect of radiative transfer which takes into account the surface reflectivity for long wave radiation, as well as the effect of turbulent transfer. Although the occurrence of the "cold layer" near a bare soil surface on clear nights reported by FLEAGLE and BADGLEY and LAKE was not confirmed so definitely, it was suggested that the existence of it under more suitable conditions may also be explained by taking the surface reflectivity into consideration. *Subject Headings:* **1. Temperature profiles 2. Humidity profiles 3. Turbulent transfer of heat.**—*Authors' abstract.*

11.11–189 551.524.7:551.557:551.510.53

*Lowenthal, Marvin and Arnold, A., **High altitude radiosonde flights, 1956, Pt. 4.** *U. S. Signal Research and Development Lab., Ft. Monmouth, N. J., Technical Report*, 2018, March 15, **1959.** 178 p. 40 figs., 6 refs., mostly tables. **DWB** (M(055) U582us)—High altitude radiosonde flights made for or by the Signal Corps during Jan. and July 1956 at 8 stations in North America located along 2 longitudinal sections from the Arctic to the tropics (Ft. Greely, Alaska; Salem and Portland, Oreg.; Santa Monica, Calif.; Narsarssuak, Greenland; Goose Bay, Labrador; Belmar, N. J.; Patrick A. F. B., Fla.) and 2 central U. S. stations (Chanute A. F. B., Ill. and Lowry A. F. B., Colo.), are analyzed and data presented *in extenso* and also in analytical and summarized form. These flights were begun in Aug. 1954. Mean temperature and standard deviation of temperature and mean winds are shown for each station for each month (Jan. and July), and mean cross sections along east and west coast, mean zonal winds and mean 20 mb maps for Jan. and July presented. The January map is not reliable for Canada and Alaska. During Jan. 1956 abnormally warm air was noted in the stratosphere in the middle Atlantic area and WNW to 60°N on the west coast. Stratospheric easterlies are stronger in the summer than are winter westerlies at the same height. (For Pt. 1, 2 and 3, *see* 8.4–25, April 1957, 10.8–247, Aug. 1959 and 10.6–19, June 1959, *Met. Abstracts.*) *Subject Headings:* **1. High level wind data 2. High level radiosonde data 3. Stratospheric temperatures 4. Stratospheric winds 5. Mean 20 mb charts 6. North America.**—*M.R.*

11.11–190 551.524.73:551.508.822(473)

*Belogurov, Iu. A., **O sutochnom khodetemperatury po dannym aerologicheskikh nabliudeniĭ.** [Daily temperature variations according to aerological observational data.] *Meteorologiia i Gidrologiia*, Leningrad, No. 4:39–42, April **1959.** 2 tables, 4 refs. **DWB, DLC**—In order to analyze in detail the daily atmospheric temperature variations up to elevations of 20 km, the author carried out radiosonde ascents every two hours during the period May 16–24, 1955 from 0100 to 2300 o'clock. Tables are presented giving the deviation from the mean daily temperatures for each hour of observations and daily amplitude for 12 daily and for 4 daily observations for specified altitudes and the amplitudes of daily variation of temperature in the free atmosphere at specified levels according to different observations. From the 12 times a day observations it was determined that at the surface of the earth the maximum temperature was 1.5°C greater than according to their 4 times a day observations. At 4–10 km the difference did not exceed 0.5–0.7°C but further it increased again with height. The increase in amplitude was more marked throughout the entire layer of the atmosphere (4–20 km) in the case of 12 times a day observations. The amplitudes obtained with 4 times a day observations were less than the 12 times a day observations at altitudes of 9–20 km by 1.8–1.9°C, on the average. The 12-hour observations indicated more clearly the individual phases of daily variations; the times of occurrences of extreme temperatures at different levels are displaced earlier relative to the extremes determined according to 4 times daily observations. In the lower troposphere the temperature amplitude increased with altitude. At 4 km its

increase was 4.9°C; at 8 km it was 36°C and remained as such up to 13 km. Above 12–13 km this value diminished and at 20 km it did not exceed 1.0–0.5°C. Without radiational corrections the daily amplitude increased with height in the stratosphere. The results of the author were compared with those of SELEZNEVA (Slutsk), RIEHL (Caribbean Sea) and the computations of MALKEVICH. *Subject Headings:* **1. Diurnal upper air temperature variations 2. Radiosonde data 3. Moscow, U.S.S.R.**—*I.L.D.*

SOIL TEMPERATURE

See: **Frozen soil effect on meltwater supply** (Parshin, Morokhovets), **11.11–248.**

WATER TEMPERATURE

See also: **Water temp. variations for fisheries research** (Needham, Jones), **11.11–172.**

11.11–191 551.324.24:551.526(988)

Loewe, Fritz, **Remarques concernant des mesures de température et d'accumulation sur l'Inlandsis Groenlandais.** [Remarks on temperature and accumulation measurements on the Greenland Ice Cap.] *Annales de Géophysique*, Paris, 13(2):158–159, April/June **1957.** 7 refs., eqs. **DLC**—GEORGI's contention that a snow layer of higher temperature than that below or above found in 1950 at Eismitte II at a depth of 19 m is identical with that discovered at a depth of 8–9 m by SORGE in 1930 at Eismitte I (at a distance of 35 km to the N.) is examined theoretically. The thermal changes that would occur over a 20-yr period in a snow layer of uniform temperature when the temperature conditions at its lower and upper boundaries are changed are calculated, using the thermal conductivity equation and taking into account temperature variations at the center and limits of the layer, the increase in snow density with time, compaction of the layer, and the specific heat of snow. GEORGI's conclusion is found untenable, since, according to calculations, the particular layer would be only 0.001°C warmer than the rest of the snow after 2 yr. The excess in temperature of 1.25°C observed in 1950 at a depth of 17–27 m. over that of the snow of the same age in 1930 is attributed to the difference in elevation and position of the 2 stations which would account for 0.7°C and to a warming of 0.9°C at the surface between 1930–1950 which would increase the temperature at a depth of 20 m by 0.6°C. *Subject Headings:* **1. Greenland ice temperature 2. Ice accumulation-temperature relationships 3. Greenland.** —*SIPRE abstract.*

11.11–192 551.526.6:551.513.1(266)

†Namias, Jerome (*Extended Forecast Sec., U. S. W. B., Wash., D. C.*), **Recent seasonal interactions between North Pacific waters and the overlying atmospheric circulation.** *Journal of Geophysical Research*, Wash., D. C., 64(6):631–646, June **1959.** 18 figs., 20 refs. **DWB DLC**—The recent pronounced anomalous warming of surface waters of the eastern North Pacific is related to prevailing abnormalities in the overlying atmospheric circulation. The gross features of the abnormalities in water temperature patterns during the cold season appear to be caused by abnormal wind components. The data suggest that a preponderant surface drift of water masses from warmer (or colder) sources is induced, and this may be augmented by divergence and upwelling factors. The summer surface-water temperature patterns suggest, in addition to surface advection, the possibility of heating through enhanced insolation combined with light wind. An attempt is made to ascribe long-period continuity to the atmospheric mean seasonal circulations from summer 1957 through spring 1958 and to hypothesize that this continuity is the result of a certain interplay (involving feedback) between ocean and atmosphere against the slowly changing climatological background. *Subject Headings:* **1. Warming of surface waters 2. Water temperature-wind relationships 3. Ocean-atmosphere interaction 4. North Pacific.**—*Author's abstract.*

11.11–193 551.526.6(266

Schulze, E. Paul, **Unusual variations in sea water temperatures.** *Mariners Weather Log* Wash., D. C., 3(5):182, Sept. **1959.** table. **DWB**—Tabulated data of sea temperature taken aboard S/S Korean Bear, March 18, 1959 at 40°00′N lat., 150°42′E long., show 48°F at 123 GMT, 38° at 1330 GMT when position was 40°05′N lat., 150°55′E long. This is the firs

recording of such a sudden change in short time within limited geographic region, according to Biological Lab., Stanford, Calif. *Subject Headings:* **1. Sea temperature variations 2. North Pacific.**—*W.N.*

11.11–194 551.465:551.526.6(261)

Worthington, L. V., **The 18° water in the Sargasso Sea.** *Deep-Sea Research*, New York, 5(4):297–305, May **1959.** 5 figs., table, 7 refs. **DWB**—The surface waters of the northern Sargasso Sea cool to a temperature of about 18°C each winter, forming an isothermal layer more than 350 m deep. This layer is also isohaline at 36.5 $^0/_{00}$. Much water with these characteristics is converged in this area and flows off to the south at the 300 m level. The excess of "18° water" formed each winter immediately south of the Gulf Stream can be clearly detected throughout the Sargasso Sea, at least as far south as the 20th parallel North. Some of the implications of this are discussed. *Subject Headings:* **1. Sea surface temperature variations 2. Sargasso Sea.**—*Author's abstract.*

11.11–195 551.526.84:551.524:536.24

Nesina, L. V., **O raschete teploobmena v vodoemakh.** [Calculation of the heat exchange in reservoirs.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy*, 59(121):29–36, **1956.** 7 figs., table, 6 refs., 2 eqs. **DLC, DWB**—The equation of heat balance for a water surface is given by $R=p+LE+B$, where B is heat exchange in water. For the ice free period $B=B'+Q_0+Q_b$, B'=variation of heat content of water, Q_0=advective heat flow due to currents, Q_b=heat exchange with the bottom. When $B=-\lambda(\partial\theta/\partial z)$ then λ=coefficient of heat exchange in water. Under conditions where $Q_0=Q_b\cong 0$, $B=B'$; the heat exchange is equal to heat content which can be determined by the distribution of water temperature with depth and time. The heat exchange in water was studied on the basis of measurements of temperature carried out on Lake Krasavitsa (Leningrad Region) and the Tsimliansk water reservoir. Values of mean daily heat exchange computed from the temperature distribution in the water for each month from May–September are presented. The results of temperature measurements in the Tsimliansk (presented on graphs) indicate that heat exchange cannot be measured by $B=B'$, since advective radiational tidal elements, etc., are involved. Heat exchange in water for an interval of time t is given by the equation $B\cong uzt\dfrac{\partial T}{\partial x}+\int_0^H (T-T_0)dz$ where u=current velocity. The conclusions drawn from this study are as follows: In computing heat exchange in water for shallow reservoirs the heat exchange with the bottom need not be considered in the first approximation. The heat exchange of water for short periods of time (day or less) can never be computed from the heat content in the case of shallow reservoirs (depth of 5–10 m). With increasing time intervals the heat exchange diminishes. In the Tsimliansk reservoir 12% of the heat of the radiation balance is expended for heating the water 3 or more days in July. *Subject Headings:* **1. Heat exchange in reservoirs 2. Lake Krasavitsa, Leningrad 3. Tsimliansk reservoir, U.S.S.R.**—*I.L.D.*

PRESSURE AND WIND

PRESSURE

See also: **Ionospheric pressure equalization** (Johnson), 11.11–53; **25 mb heights, Arctic** (Orvig), 11.11–119; **Geopotential height forecasting** (Peshkova), 11.11–124; **Semi-annual pressure waves** (Fedorov), 11.11–141; **Jet stream winds** (Endlich, McLean), 11.11–143; **Anticyclone movement** (Luzhnaia), 11.11–160; **Lee waves** (Zierep), 11.11–220; **Synoptic patterns, upper winds and precip. over Italy** (Gazzola, Montalto), 11.11–231.

11.11–196 551.541:551.551:551.515.4

Pasechnik, I. P., **Dlinnoperiodnye vozdushnye volny, voznikaiushchie pered grozami.** [Long period atmospheric waves preceding thunderstorms.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 3:471–475, March **1959.** 4 figs., table, 8 refs. **DLC**—The long period atmospheric waves recorded on seismic records of microbarographs before thunderstorms represent a relatively short train of oscillations of atmospheric pressure of quasisinusoidal

form containing a total of 3–4 extremes. The periods of oscillation are of the order of 4–12 min.; their maximum amplitude is of the order of 100–200 "bar" and in some cases 500–600 "bar." The total length of a record usually does not exceed 20–30 min. These waves are observed usually 20–40 min. before the start of thunderstorm rain. Usually one or two impulses of atmospheric pressure are observed before the start of rain. The impulse character of the atmospheric waves arising before thunderstorms is indicated by the fact that the form of such waves coincides with the form of atmospheric waves that appeared during the eruption of Bezymiannyĭ volcano on March 30, 1956. A comparison is made of the records of atmospheric waves of mototypic microbarographs with a large rate of scanning equal to 8.5 mm/min obtained during the eruption of the volcano and before thunderstorm rainfall. The similarity between the two indicates that the latter is produced by an impulse source with a steep anterior front since the duration of the impulses in the source may be very small, of the order of several milliseconds. During propagation in the atmosphere the duration of the impulses increases sharply with increased distance from the source because of the absorption of oscillation energy. The seismic oscillations, produced by atmospheric waves at the point of observation, are discussed. *Subject Headings:* **1. Atmospheric waves 2. Pressure wave-thunderstorm relationships.**—*I.L.D.*

11.11–197 551.542.1

Schindler, Gerhart, **Ein barometrisches Profil des Seeweges Baltimore-Rio de Janeiro.** [A barometric profile of the Baltimore-Rio de Janeiro sea route.] *Wetterlotse*, Hamburg, No. 137:237–239, Oct. **1958.** 2 figs., 2 tables. **DWB**—The profile is based on hourly barometer readings Sept. 1–16, 1958 and it is shown that the departures from the mean values are good indicators for weather changes. *Subject Headings:* **1. Barometric profile 2. Baltimore-Rio de Janeiro sea route.**—*W.N.*

11.11–198 551.543:551.557.3

Dahler, H., **Luftdruckänderungen, insbesondere die Fickerschen Druckschwankungen in neuer Auffassung durch Einbeziehung der Winddrehung mit der Hohe.** [Atmospheric pressure changes, especially the Ficker pressure fluctuations, using a new approach which includes wind shear with height.] *Zeitschrift fur Meteorologie*, Berlin, 12(9/10):257–273, Sept./Oct. **1958.** 7 figs., 15 refs., 5 eqs. **DWB, DLC**—The coupling of upper and lower pressure fluctuations during advective pressure changes discovered by H. von Ficker, was explained by the wind shear with height $\partial\alpha/\partial z$ or $\partial\alpha/\partial p$ to which little regard has been given hitherto. Correspondingly, the upper pressure fluctuations (maximums at the tropopause) were regarded as tropospheric and essentially of thermal or thermal advective origin, while the lower (near the surface) pressure fluctuations had to be explained chiefly as flow effects in association with temperature advection. The warm high pressure region and cold low pressure region, which hitherto were regarded as atmospheric pressure paradoxes, are explained dynamically from the existence of a baroclinic flow. The origin or displacement of the tropopause depends largely upon thermal advection. The stratospheric temperature compensation of the tropospheric temperature changes consists in general of a dynamic and an advective component, and the former in particular is to close relationship with the tropospheric advection. The six examples of temperature-pressure variation during thermal advection extending to great height, presented by von Ficker (1920), are with four special cases (wave disturbance and drifting low aloft) extended to a total of ten cases. The practical significance of radar wind measurement in weather service and weather forecasting as well as in aviation, a new coding of wind direction and an increase in density of the radar wind measurement network are discussed. *Subject Heading:* **1. Pressure change-wind shear relationships.**—*Transl. of author's abstract* (*I.L.D.*).

11.11–199 551.543:551.571:551.586:612.014.4

†Hale, Frank C.; Westland, Ronald A. and Taylor, Craig L., **Barometric and vapor pressure influences on insensible weight loss.** *Journal of Applied Physiology*, 12(1):20–28, Jan. **1958.** 3 figs., 4 tables, 29 refs. **DLC**—The effect of barometric pressure and vapor pressure upon human insensible weight loss was investigated by subjecting those nude subjects to barometric pressures of 760, 506 and 253 mm Hg in combination with water vapor pressures of 6, 16 and

26 mm Hg. The chamber temperature was kept constant at 28°C and air movement not exceeding 580 m/hours was maintained. Sweating was avoided and weight loss was measured directly. Using an orthogonal square design technique, the authors found that total body weight loss in a sweat free subject is inversely dependent upon both vapor pressure and barometric pressure. The calculated skin insensible weight loss is also dependent inversely upon barometric pressure but is not clearly related to vapor pressure. *Subject Headings:* **1. Pressure effects on weight loss 2. Insensible weight loss.**—*Author's abstract and I.L.D.*

11.11–200 551.543.1/2(468.2)

*Hurst, G. W., **Variation of pressure at Gibraltar.** *Meteorological Magazine*, London, 87(1036):294–300, Oct. **1958.** 2 figs., 4 tables, 3 refs. **DWB**—A statistical study of pressure variations (diurnal and seasonal) at Gibraltar (36°N, 5°W), based on data for several stations 1913–1956, and for North Front (1947–56). Comparison of the two for each month, season and year shows little difference in general. Standard deviations are given, and on a graph the seasonal variation of average and of 90% range of average pressure for the two populations for 1913–1956 and 1947–56 and the diurnal variations for North Front (1952–56) for year, summer and winter are shown. Both regimes show a bimodal distribution (maximum in December–January and in June, and at 10 a.m. and 10 p.m., respectively). Extreme values for each season and values expected to be exceeded every 10 and every 100 years are tabulated. *Subject Headings:* **1. Pressure variations at Gilbraltar 2. Gibraltar.**—*M.R.*

11.11–201 551.547:551.511.12

T'u, Hsin-Yüan, **Reshenie prostrantsvennoĭ zadachi izmeneniia geopotentsiala vo vremeni s utochennoĭ zamenoĭ laplasiana konechnymi raznostiami.** [Solution of the spatial problem of the change in geopotential with time, in which the substitution of finite differences for the Laplacian is made more accurate.] *Meteorologiia i Gidrologiia*, Leningrad, No. 1:31–33, Jan. **1959.** fig., table, 4 refs., 11 eqs. **DWB, DLC.** Transl. into English by Judith I. B. Danner, issued by the American Meteorological Society, under Contract AF 19(604)-1936 as its T-R-199t, June **1960.**—The author develops a simplified method for substituting the Laplacian so that the spatial problem of the variation of the geopotential with time is solved by means of a more accurate substitution. On any isobaric surface any meteorological element M appears approximately a plane function of the variables X and Y and this function can be analyzed into a Taylor series. The analysis of M in the vicinity 0 for a net of a triangular type is presented and it is shown that the smaller is h, the distance between points, the smaller is the error but with diminishing h the effect of instrumental error increases. In the case of a triangular type net, the error produced by the substitution of the Laplacian by finite differences is proportional to h in the highest power so that this type of net allows the use of larger h and at the same time diminishing the effect of instrumental error. The derivative of the geopotential with respect to time on any isobaric surface is obtained and is written in the form developed by M. I. Iudin and its solution in two ways is illustrated. *Subject Heading:* **1. Geopotential height changes. I. Danner, Judith I. B.** (*transl.*).—*I.L.D.*

TURBULENCE

See: **Atmos. diffusion symposia** (Frenkiel, Sheppard), 11.11–4; **Ionospheric turbulence** (Wheelon), 11.11–60; **Richardson's criterion of turbulence** (Dugstad), 11.11–133; **Superadiabatic wind profiles** (Priestley), 11.11–137; **Stack effluent diffusion** (Scorer), 11.11–138; **Monin-Obukhov similarity theory** (Taylor), 11.11–139; **Stack effluent diffusion** (Smith et al.), 11.11–187; **Pressure wave-thunderstorm relationships** (Pasechnik), **11.11–196**; **Study of turbulence in climat.** (Panchev), 11.11–254.

WIND VARIATIONS AND VERTICAL DISTRIBUTION

See also: **Diurnal wind variations** (Haltiner), 11.11–134.

11.11–202 551.553.21(5–011)

†§Flohn, Hermann, **Zur Kenntnis des "Monsuns" in Ostasien.** [Study of the monsoon in East Asia.] *Stuttgarter Geographische Studien*, Stuttgart, 69:263–275, **1957.** 3 figs., 3 tables, 41 refs.—In this study the object is a 3-D vertical cross-section from northernmost Formosa

to Hokkaido featuring the wind distribution over Korea, moisture transport over the east Asiatic coastal area and the climatic structure of the summer weather conditions. July 1952 was the most representative of these conditions. The discussion includes the meridional distribution of wind and temperature, water vapor content and wind distribution over Korea, weather conditions related to summer rains, normal procedure of summer weather in Korea and aerology of the winter monsoon in East Asia. Graphs and tables are provided. *Subject Headings:* **1. Monsoons 2. East Asia.**—*W.N.*

11.11–203 551.553.21(54)

Markgraf, Hans (*Hamburg*), **Kleine Ergänzung zum Bild des Indischen Monsuns.** [An addition to the knowledge of the Indian monsoon.] *Annalen der Meteorologie*, Hamburg, 8(11/12):359–362, **1959.** 4 figs. English summary p. 359. **DWB, DLC**—With the aid of ship's records taken from punch-cards, which are available in the archives of the Seewetteramt for 15 selected areas, the beginning and ending of the summer and winter monsoons in the Arabian Sea and the Gulf of Bengal have been determined. Both winter and summer monsoon originate in the area near the coasts of India from where they extend southward. In summer, the process of heating in South Asia produces a monsoon circulation increasing day by day, with its lower branch finally joining with the SE trade-wind of the Southern Hemisphere, which is advancing north toward the equator. *Subject Headings:* **1. Monsoons 2. India.**—*Author's summary.*

11.11–204 551.553.21(210.5,529)

Rain Stimulation Research Institute, Taipei, China, **The Taiwan northeastern monsoon inversion.** Issued May **1958.** 12 p. 4 figs. In Chinese and English. **DWB**—The author from his study of the Taiwan northeastern monsoon inversion has concluded that the winter air mass inversions are normally associated with subsidence, that the rainfall does not directly dissipate monsoon inversions and that these inversions are dissipated indirectly by post frontal rain inducing cyclonic waves in northern waters of the Taiwan Sea. *Subject Headings:* **1. Monsoon inversions 2. Taiwan Sea.**—*N.N.*

11.11–205 551.554:533.6.07

*Lees, Sidney and Larrabee, E. E., **Wind tunnel tests.** United Research Inc., Cambridge, Mass., Contract DA-36-039 SC-75064 (Measurement of wind shear), First Quarterly Report, May 1–Sept. 30, **1958.** 47 p. numerous figs., tables, 3 refs., eqs. **DWB** (533.6U584me)—Wind tunnel tests have been made on a model of the wind shear probe discussed in the Final Report of a Study on Wind Shear Measurements concluded under Signal Corps Contract No. DA-36-039 SC-73204. These tests show the probe to have aerodynamic properties consistent with its theoretical mode of operation. Some of the characteristics are more favorable than had been anticipated. The tests established aerodynamic damping about a normal axis as well as static characteristics. An airlog was calibrated also. The wind tunnel tests and results are discussed in Ch. I. Analysis of the data leads to the specification of the final configuration of the probe subject to the results of an investigation of structural weight. A noninstrumented probe will be dropped to establish its gross stability and response. The description of the recommended configuration is given in Ch. II. A flight test procedure is described in Ch. III for the purpose of evaluating the aerodynamic tuning condition. A theory is proposed for determining the tunnel condition employing wind shears existing in the atmosphere. A consequence of this theory, that it is possible to use a probe with a fixed center of gravity and allow for its detuned vehicle, is discussed in Ch. IV. Further investigation including numerical analysis will be carried out in the next period. A revised development program is outlined taking into account the proposed flight test and the newly developed concept of the detuned vehicle. *Subject Headings:* **1. Wind shear probe 2. Wind tunnel experiments.**—*Authors' abstract.*

SPECIAL WINDS

See also: **Trade winds in geological periods** (Opdyke, Runcorn), **11.11–73.**

11.11–206 551.555(494.44)

Bouët, Max, **Foehn, vaudaire et grain orageux.** [Föhn, vaudaire and thunder squalls.] *Murithienne, Sion Switzerland*, 75:1–8, **1958.** fig., 2 refs. **DLC, DA**—Description of a

thunder squall moving up the Rhone valley (Valais) during föhn situation. The excess of mass produced through cold discharge in the valley, creates a downstream current superposed on the föhn and reaching Lake of Geneva. The author considers that only two clearly defined types of vaudaire exist. The former is the case of typical föhn over Lower Valais; it is of long duration and extends over a wide geographical area. The latter is the case of all the gales of shorter duration, and related to the passage of a thunderstorm, a squall or a cold front over Valais. This case concerns the moving of a relatively cold mass of air towards the lake and the surging back of an excess of air in the wide Rhone valley, under the action of local excess of pressure. *Subject Headings:* **1. Local winds 2. Thunder squalls 3. Föhn 4. Vaudaire 5. Valais, Switzerland.**—*A.V.*

11.11–207 551.555:551.501.75(743)

Davidson, Ben, **Observations and theory of local wind systems.** N. Y. Univ. College of Engineering. Research Div. Dept. of Meteorology and Oceanography, Contract DA-36-039-Sc-78127 (Local Wind Systems), Quarterly Progress Report, No. 1, Jan. 1–March 31, **1959.** 6 p. Also: Quarterly Progress Report, No. 2, *Ibid.*, April 1–June 30, **1959.** 9 p. fig., eqs. **DWB** (M(051 N532Lo)—These reports cover an investigation carried out from Jan. 1 to June 30 of the local wind field that surrounds some well-defined valleys, the isolated cleared hills, the flat farmland and the sequences of relatively flat cleared and wooded areas around Manchester, Vt. The first report describes the scene of the projected experiment and briefly discusses the design of the experiments and lists the available equipment. The second report gives results of investigation (conducted April 1–June 30, 1959) of the relationship between the development of valley winds and the variations of cloudiness, radiation conditions, and prevailing wind speed in two Vermont valleys. The preliminary results of the investigations on the observation procedures and the theory of the local wind systems are analyzed. *Subject Headings:* **1. Valley winds 2. Vermont.**—*N.N.*

11.11–208 551.555(438,437)

§*Lewínska, Janina, **Wiatry Ryterskie i Rymanowskie.** [Winds of Rytro and Rymanów.] *Przegląd Geofizyczny*, Warsaw, 3(1):17–26, **1958.** 5 figs., 5 tables, 15 refs. **DWB, DLC**—The results of a study of the origin and effect of local föhn type winds blowing mainly in autumn and winter in a southerly direction along the valleys of the Poprad and Tabor Rivers are presented in a series of tables, graphs and charts, and commented on. The study was carried out on the basis of observational data from local meteorological stations. The author's investigations showed that the winds are caused in a synoptic situation where low pressure centers occur to the northwest of the Carpathian mountains over the Atlantic and the Arctic Oceans, and move eastward. The speed of winds often reaches 20 m/sec and even 30 m/sec; a warming up of temperature follows. *Subject Headings:* **1. Local winds 2. Rytro, Poland 3. Rymanów, Ukrainian S.S.R.**—*A.M.P.*

11.11–209 551.555:631.67:551.556.2:551.588.6

Vorontsov, P. A., **O mestnykh tsirkuliatsiiakh vozdukha v raĭonakh s melioratsieĭ klimata.** [Local air circulations in regions of ameliorated climate.] (In: Akademiia Nauk SSSR. Institut Geografii, **Sukhovei ikh proiskhozhdenie i bor'ba s nimi.** Moscow, **1957.** p. 296–303. 6 figs., 4 tables.) **DLC** (QC940.R9A6)—This is a study of the genesis and effect of local winds in regions where physical and geographical conditions were changed by the introduction of large scale irrigation, creation of immense water reservoirs and forest shelter belts. The analysis covers: 1) local air circulation between a desert and an irrigated oasis, and 2) local air circulation in fields surrounded by protective forest belts. *Subject Headings:* **1. Local winds 2. Irrigation-weather relationships 3. Forest shelter belt effects on local circulation.**—*A.M.P.*

11.11–210 551.555.3(491.1)

§Ashwell, I. Y. (*Portsmouth Grammar School*) and Hannell, F. G. (*Univ. of Bristol*), **Notes on föhn wind in Iceland.** *Weather*, London, 13(9):295–297, Sept. **1958.** 3 figs., 2 refs. **DWB**—The authors describe a föhn wind observed in Iceland on Sept. 6, 1956, 1330 GMT in the valley between the ice caps of Eiriksjökull and Langjökull. Sudden dust clouds, caused by a southerly wind, appeared in the valley below at some distance from the edge of Langjökull.

From a point in the valley the dust was seen to ride up the face of the escarpment and a large roll cloud rested against the top of the slope. The desert areas lying immediately on the lee of an ice cap are affected by glacier winds, while beyond these areas a wind of föhn type produces dust-devils and dust storms. The observed effects were the result of similar föhn conditions with southerly winds. Diagrams illustrating the phenomena are presented and the prevailing synoptic situation is described with the aid of a synoptic map. *Subject Headings:* **1. Föhn winds 2. Iceland.**—*I.L.D.*

11.11–211 551.555.3:551.556.2:551.588.6

Iudin, M. I., **K otsenke zashchishchennosti ot sukhoveev poleĭ okruzhennykh lesnymi polosami.** [Evaluation of the effectiveness of forest shelter belts in protecting fields against dry winds.] (In: Akademiia Nauk SSSR. Institut Geografii, **Sukhovei ikh proiskhozhdenie i bor'ba s nimi.** Moscow, **1957.** p. 304–310, 2 figs., 7 refs.) **DLC** (QC940.R9A6)—A theoretical paper in which the author discusses the effectiveness of forest shelter belts of various heights and densities, and introduces a method of calculating the optimum sizes of fields surrounded by shelter belts. *Subject Headings:* **1. Forest shelter belt effects 2. Dry winds.**—*A.M.P.*

11.11–212 551.555.3:551.511.2

Vorontsov, P. A., **O transformatsii vozdukha pod vozdeĭstviem podstilaiushcheĭ poverkhnosti pri sukhoveiakh i fënakh.** [Transformation of the air under the influence of the underlying surface during dry winds and föhn.] (In: Akademiia Nauk SSSR. Institut Geografii, **Sukhovei ikh proiskhozhdenie i bor'ba s nimi.** Moscow, **1957.** p. 221–247. 13 figs., 9 tables, 20 refs., eqs.) **DLC** (QC940.R9A6)—A detailed study of the phenomena made on basis of aerological observations in the lower atmospheric layer, carried out for: 1) lowland dry wind in the Kamennai Steppe (Voronezh Region) in June-July 1950, 2) desert dry winds in southern Kazakhstan in 1952 and 3) föhn (mountain dry wind) in the Rion Valley (Western Georgia) in 1935–1936. It has been shown that the formation of dry winds, particularly föhn, and their intensity in the lower atmospheric layers are both linked with marked synoptic processes, i.e., with general circulation factors and conditions of the underlying surface, and particularly with its moistening. The transformation of air masses at any given moment depends on the correlation of individual components of the heat balance. *Subject Headings:* **1. Air mass transformation 2. Sukhovei 3. Föhn development 4. Surface effects on air mass 5. U.S.S.R.**—*A.M.P.*

11.11–213 551.555.6:551.524.36(798)

§Williams, George C. (*U. S. W. B., Chicago, Ill.*), **A cold wave strikes interior Alaska.** *Weatherwise*, Boston, 11(5):164–165; 182, Oct. **1958.** 3 figs. **DWB**—A case history description of a cold wave that occurred in the Tanana Valley on Feb. 22, 1953, even though the front was evidently weak or dissipating. Synoptic charts show the progress of the cold wave across Alaska from Siberia. At Fairbanks the temperature dropped from −10° to −45° by midnight and to −50° or lower by morning (−58°F at Tanana). Three upper air soundings made at Fairbanks show depth and intensity of cold air invasion. *Subject Headings:* **1. Cold waves in Alaska 2. Fairbanks, Alaska.**—*M.R.*

11.11–214 551.555.8(536):551.507.352

Gavin-Robinson, C. B., **Duststorm, Qatar Peninsula, Persian Gulf.** *Meteorological Magazine*, London, 87(1030):116–118, April **1958.** 3 figs., photo (p. 113). **DWB, DLC**—A photograph of a dust storm around the base of a cumulonimbus cloud observed during an airplane flight over the Qatar Peninsula on the afternoon of Sept. 4, 1957, is reproduced. The storm was observed en route from Dukhan to Umm Said at 1600 local time. Descriptions of the development of the storm by GAVIN-ROBINSON while in flight, and of the same storm at Bahrein by F. E. DINSDALE are presented. The cumulonimbus was at a height of about 35,000–40,000 ft. The tephigram for 1200 G.M.T. at Bahrein is presented. The surface temperature over Qatar during the early afternoon was around 110°F. *Subject Headings:* **1. Dust storms 2. Airplane observation of dust storms 3. Qatar.**—*I.L.D.*

11.11–215 551.555.8

Sokolov, I. F., **Pyl'naia buria v Primor'e.** [Dust storm in Primor'e.] *Meteorologiia i Gidrologiia*, Leningrad, No. 3:45–46, March **1957. DWB, DLC.** Transl. into English by John Miller, issued by the American Meteorological Society, under Contract AF-19(604)-1936, as its T-RG-12, Nov. **1958.** 1 p. Complete.—A description of an intensive dust storm observed April 14, 1958 over the Prikhankai depression. This storm, which occurs rarely in the monsoon climate of Primor'e, embraced 20,000 km² and lasted 5–8 hrs; it was the most intense storm recorded in 75 yrs. The velocity of the southwest wind attained 22–24 m/sec and individual gusts exceeded 30 m/sec. Diurnal air temperature rose to 11°C and relative humidity fell to 22%. *Subject Headings:* **1. Dust storms 2. Primor'e, U.S.S.R.**—*I.L.D.*

WIND EFFECTS

See also: **Wind effects on sea level forecasting** (Lebel, Gelcé), 11.11-122; **Shelter belt effects on circulation** (Vorontsov), 11.11–209; **Shelter belt effects** (Iudin), 11.11–211.

11.11–216 551.556.8:551.465:551.351

Knars, R. Ia., **O metodike opredeleniia kharakteristik dvizheniia nanosov na bezlivnykh moriakh.** [Method of determining the characteristics of the movement of deposits in tideless seas.] *Lietuvos TSR Mokslų Akademija. Geologijos ir Geografijos Institutas, Moksliniai Pranešimai*, Vol. 3, Geofizika, Hidrologija, issued Vilna, **1956.** p. 141–152. 7 figs. (incl. photos), 2 tables, 8 refs., eqs.—The dynamics of deposits, which is so important in studies on the silting of ports along sandy coasts, involves first of all, an examination of the force causing migration, which in the case of tideless seas is the wind energy transmitted to the water and causing wave action. The wind energy transmitted to the water can be measured by the Munch-Petersen formula, namely $E=pv^2\sqrt{D}$. The transport capacity of the deposit T is given by $T=pv^2\sqrt{D}\cos\alpha=E\cos\alpha$. The amount of sediment transported in a year or thickness of the sediment stream is given by $M=cpv^2\sqrt{D}\cos\alpha=cT$ where p=percent frequency of wind (relative time); v=mean wind velocity in m/sec; D=length of fetch in kilometers and $\cos\alpha$=coefficient of projection of vectors along the direction of the coast. The application of this method to a coast is illustrated. The Munch-Petersen formula does not reflect all movements of marine deposits and does not describe accurately the natural phenomenon that the cosine law increases the influence of winds along the coasts. For the Baltic Sea with its cyclonic storms the formulas assume the following form:

$$T=pv^3\sqrt[3]{D}\xi\beta; \qquad B=pv^3\sqrt[3]{D}\eta\beta; \qquad E=\sqrt{T^2+B^2}$$

where T=resultant transporting force (+ right, − left); B=force of turf; E=resulting energy vector; β=ice coefficient. The results of computations of the characteristic sedimentation regime along the coasts of the Lithuanian S.S.R. and Kaliningrad Region are presented in tables and are discussed. *Subject Headings:* **1. Wind effects on silt deposition 2. Silting 3. Wave action.**—*I.L.D.*

UPPER AIR WINDS

See also: **Ionospheric movements** (Johnson), 11.11–53; **Jet stream winds** (Endlich, McLean), 11.11–143; **Tropical jet stream** (Prudhomme, Valtat), 11.11–144; **Jet stream reconnaissance,** 11.11–145; **Geostrophic wind above anticyclone centers** (Luzhnaia), 11.11–160; **High level wind data** (Lowenthal, Arnold), 11.11–189; **Pressure change-wind shear relationships** (Dahler), 11.11–198; **Synoptic patterns, upper winds and precip. over Italy** (Gazzola, Montalto), 11.11–231

11.11–217 551.501.75:551.557

U. S. Weather Bureau, **Upper wind test project,** Wash., D. C., **1958.** 19 p. table, eq. Photostat of typescript. **DWB**—Comparative winds-aloft observations were taken using rawin sets AN/GMD-1A and AN/GMD-2, a Decca Windtracking Radar, and a conventional optical theodolite. These observations show good agreement in wind directions and speeds obtained with the various systems; however, some rather large apparent differences would arise in the data were it reported at fixed altitudes. This is owing to differences in heights

obtained by the various methods. *Subject Heading:* **1. Upper air wind measurement technique comparisons.**—*Author's abstract.*

VERTICAL MOTION

See also: **Evolution of convection** (Malkus), 11.11–128; **Vertical velocity effects on freezing nuclei** (Roulleau), 11.11–226.

11.11–218 551.558

Panofsky, Hans A.; Curtis, Robert C. and Miller, Albert, **Large-scale vertical motion and weather during a winter and summer period.** Pennsylvania. State Univ. Mineral Industries Experiment Station. Dept. of Meteorology, Contract AF 19(604)-1025, Final Report, Sept. 1, 1957. 54 p. 7 figs., 22 tables, 3 refs., eqs. **DWB** (M58 P415s)—A report on a study of effects of vertical velocities and other parameters on probability of cloudiness and precipitation for January and July 1955. Different methods were used for estimating vertical motion in winter, in summer only the kinematic technique worked. The latter method gave a standard error of 1.4 cm/sec., and numerical prediction methods, 0.9 cm/sec. Vertical motions are strongly related to probability of precipitation in both winter and summer, but relative humidity is most important in predicting summer thunderstorms in day time (vertical velocities are most important at night). Tables show probability of precipitation as a function of moisture and vertical motion. Lapse rates and Showalter Indexes are also tabulated. *Subject Heading:* **1. Vertical motion—weather relationships.**—*M.R.*

11.11–219 551.558.21:551.576.11:779

Monteith, J. L., **Lee waves in Wester Ross.** *Weather*, London, 13(7):227–230; 233–234, July **1958.** 3 figs., 8 photos, 4 refs. **DWB**—A photographic sequence is presented of a peculiar and rapidly changing cloud formation. The pictures were taken from Achnacarinan, Achiltibuie, Wester Ross between 1900 and 2030, July 16, 1955. The phenomenon discussed was formed by stationary wave motion at 3000 ft in the lee of the hill believed to have caused the disturbance. Highest part of the cloud was at about 6300 ft and the lower at about 5200 ft. The synoptic situation given may have contributed to the formation and maintenance of the lee waves. *Subject Headings:* **1. Lee wave clouds 2. Cloud photographs 3. Wester Ross, Scotland.**—*W.N.*

11.11–220 551.558.21:551.541

Zierep, J. (*Berlin*), **Die Bestimmung der Leewellenströmung bei beliebigem Anströmprofil.** [On the determination of lee wave flow for any given velocity profile.] *Zeitschrift für Flugwissenschaften*, Brunswick, 1(1):9–11, June **1953.** 2 figs., 10 refs., eqs. German, English and French summaries p. 9. **DLC** (TL503.W557)—A method is developed for estimating the lee wave flow for any given ground velocity $\overline{U}(Z)$ by "layer-by-layer" calculation. The boundary surfaces between the layers present problems in stability, and in kinematics and dynamics, which are considered in the treatment. *Subject Heading:* **1. Lee wave flow calculation.**—*From author's abstract.*

AQUEOUS VAPOR, HYDROMETEORS AND HYDROLOGY

HUMIDITY

See: **Humidity profiles** (Yamamoto, Kondô), 11.11–188; **Vapor pressure effects on weight loss** (Hale et al.), 11.11–199.

EVAPORATION AND EVAPOTRANSPIRATION

See also: **Evaporation control,** 11.11–5; **Heat and moisture balance** (Grigor'ev), 11.11–130; **Evaporation and evapotranspiration data, Gabon** (Malick), 11.11–268.

11.11–221 551.573:628.82:631.563:633.491

Ash, R. S. (*International Metal Products Co., Ariz.*), **Evaporative cooling safeguards potatoes in storage.** *Air Conditioning, Heating and Ventilating*, N. Y., 55(6):79–82, June **1958.**

4 figs. **DWB, DLC**—Potatoes are both an important storage commodity and an important food. In 1956, potato production totaled 243,238,000 hundredweight. In many states potatoes are grown in such immense quantities that they cannot be marketed as soon as dug except at prices that would be ruinous to growers. It is estimated that a month's supply of potatoes is about 30 million bushels. The average late summer and fall production is about 300 million bushels. This means that the potatoes harvested from late August through November represent about a 10-month supply. Obviously, this must be stored—a large part of it for as long as six to eight months. This article covers the use of evaporative cooling for potato storage. *Subject Headings:* **1. Evaporative cooling 2. Potato storage.**—*Author's abstract.*

CONDENSATION

See also: **Adsorption,** 11.11–5; **Cloud physics** (Podzimek), 11.11–8; **Aerosol measurement** (Fenn, Weickmann), 11.11–112; **Photoelectric nuclei counters** (Pollak, Metnieks), 11.11–114; **Ice crystal formation** (Higuchi), 11.11–242.

11.11–222 551.574.1:551.578.41:536.421:546.212

Berry, R. J., **The temperature-time dependence of the triple point of water.** *Canadian Journal of Physics*, Ottawa, 37(11):1230–1243, Nov. **1959.** 9 figs., 5 tables, 18 refs. **DWB, DLC**—The important, but elusive, temperature-time dependence of the triple point of water has been thoroughly investigated in 10 triple point cells from two sources. During the first 2 days after preparation of the cells, the temperature was found to increase by amounts ranging from 0 to 5×10^{-4}°C with the average rise being 2×10^{-4}°C. After the second day the temperature continued to rise at a rate of about 0.1×10^{-4}°C per day for about a week and finally stabilized. In practice, if an ice mantle in a cell is allowed to age for about three days before the cell is used the temperature should be reproducible to about 10^{-4}°C. A series of experiments are described which suggest that this initial temperature rise may well be due to the growth of crystals in the ice and/or strains in the freshly prepared ice. The slow rise after the second day could be accounted for by crystal growth. These two possibilities are discussed in detail and a formula relating the temperature to crystal size is compared with the observed results. Tests in pyrex cells up to 5 years old showed that they contain no significant amount of impurities and, therefore, that the segregation of impurities during the freezing process is not likely to be the cause of the initial temperature variations. On the assumption that the above explanations are true, a number of methods of eliminating this troublesome initial temperature rise were tested. Since none of these tests was completely successful, methods of extending the usefulness of old mantles were examined. Different methods of preparing and using the cells were critically examined; the earlier method of supercooled freezing was found to be quite inadequate. The effect of different thermal bonds in the thermometer well and of different cell environments was investigated, As a result of this work a new importance is attached to the standard practice of melting the inner layer of ice next to the thermometer well. The effect of the temperature-time dependency on previous measurements of the difference in temperature between the ice and triple points of water is discussed. *Subject Heading:* **1. Freezing of supercooled water.**—*Author's abstract.*

11.11–223 551.574.1:551.578.11:531.32

Panchev, St., **Formula za statsionernata skorost na padane na vodni kapki s golemina ot mezhdinnata oblast.** [Formula for the terminal velocity of falling medium-size water drops.] *Khidrologiia i Meteorologiia*, Sofia, No. 1:3–8, **1958.** 4 tables, 6 refs., 24 eqs. Russian and English summaries p. 7–8. **DLC**—Below the critical drop diameter of 60μ the terminal velocity of falling drops is given, in the first approximation, by $v=\sqrt{\gamma r}$, with a correction factor for decreasing values of r. Above 60μ, Stokes's formula $v=K_2\sqrt{gr}$ applies, with a correction factor for increasing values of r. In this paper an equation is developed which combines the two formulas and is thus applicable to drops of all diameters. There is good agreement between velocities calculated by this equation and measured ones. *Subject Heading:* **1. Terminal velocity of drops.**—*Based on author's abstract.*

11.11–224 551.574.1:536.421:546.212

Miura, Akira, **On the surface free energy of ice in contact with supercooled water.** *Tohôku University, Science Reports, 5th Ser., Geophysics*, 10 (3):129–136, March 1959. 2 figs., 20 refs., 33 eqs. **DWB, DLC**—We treated thermodynamically the freezing temperature of water droplet with use of the Gibbs free energy and calculated the value of the surface free energy of ice in contact with supercooled water from many experimental results for freezing temperature of supercooled water droplets. *Subject Headings:* **1. Supercooled water drops 2. Freezing of supercooled water 3. Ice physics.**—*Author's abstract.*

11.11–225 551.574.12:551.576.12

Panchev, St., **Kŭm teoriiata na ugolemiavane na oblachnite kapki vŭv vodni konvektivni oblats.** [On the theory of cloud drop growth in convective water clouds.] *Khidrologiia i Meteorologiia*, Sofia, No. 2:3–12. 1959. 6 figs., 8 refs., 25 eqs. Russian and English summaries p. 11–12. **DLC**—The most probable mechanism for the increase of cloud drops in convective water clouds is the gravitational coagulation. Research work done hitherto on this problem has used the Stokes and Krŭstanov formulas for large drops ($r > 1200\mu$). The author uses his own formulas applicable to medium size drops and derives relationships between droplet radius, velocity of fall, distance travelled, gravitational coagulation and rate of growth. The results obtained are applicable to the quantitative study of droplet growth in convective clouds. *Subject Headings:* **1. Cloud drop growth 2. Convective clouds 3. Gravitational coagulation.**—*Based on author's abstract.*

11.11–226 551.574.12:551.558.1 551.576.11

Roulleau, Maud, **Température de congélation spontanée dans un nuage ascendant.** [Spontaneous freezing temperature in an ascending cloud.] *Puy de Dôme, Observatoire, Bulletin*, No. 1:21–26. Jan. March 1960. 2 figs., table, 6 refs. French and English summaries p. 21. **DWB**—The average duration of an ice nucleus formation apt to stop the supercooling of a water drop is a function of temperature. The number of nuclei G (per unit of volume and of time) attaining sufficient size to provoke the solidification of the supercooled liquid mass also depends on temperature. Therefore, the spontaneous freezing of the drop appears at a temperature which depends on the time necessary to reach this temperature, consequently on the vertical velocity which carries it towards high altitudes. In a drop from volume V having a diameter d, the number of nuclei formed at the temperature T can be expressed as follows:

$$N = nV = \frac{\pi d^3}{6w\beta} \int_0^{T_1} G(T)dt$$

with $w\beta = dT/dt$, cooling speed (w = vertical velocity of particles and β = vertical thermal gradient). A table indicates the computed values of $G(T)$ and $\int_0^{T_1} G(T)dt$ for temperatures ranging between $-31°$ and $-38°$. A figure reproduces the curves giving the spontaneous temperature of the drops as a function of their diameters for various vertical velocities. Article concludes with the examination of spontaneous freezing within a cumulonimbus. *Subject Headings:* **1. Ice nuclei formation 2. Freezing of water droplets 3. Freezing temperatures 4. Convective clouds.**—*A.V.*

11.11–227 551.574.4:551.579.5

Tochilov, V. I., **K teorii protsessa kondensatsii vlagi atmosfernogo vozdukha pochvogruntami.** [A contribution to the theory of atmospheric air moisture condensation by soil and sub-soil.] *Pochvovedenie*, Moscow, No. 2:7–14, Feb. 1960. 2 tables, 16 refs., 9 eqs. English summary p. 14. **DLC**—An attempt has been made to consider critically and give a more precise definition to the theory of the process of moisture condensation on the basis of published theoretical and experimental materials. The validity of the premoistening of soil which promotes the condensation process in it has been proved mathematically. A new concept of "condensation zones" in soil and the adjacent air layer has been suggested and proved. The process of moisture migration from the air layer into soil (or vice versa) has been theoretically substantiated. *Subject Headings:* **1. Condensation process 2. Soil moisture movement.**—*Author's abstract.*

11.11–228 551.574.42:625.77:656.1.05

Wehner, B. (*Technische Univ., Berlin*), **Winterliche Strassenglätte und ihre Bekämpfung.** [Road slipperiness in winter and its control.] *Umschau*, Frankfurt a.M., 59(3):70–72, Feb. 1, 1959. 3 figs. **DLC**—The dependence of the slipperiness of ice surfaces upon atmospheric temperature is illustrated by experimental data which indicates that at temperatures slightly below the freezing point, slipperiness rate is twice as great as at temperatures of about −10°C. This is explained by the fact that in the temperature range of −2°C and the freezing point a film forms easily between tires and the ice surface and it acts as a slush layer. Ice rain is particularly dangerous because the falling water drops continually renew the slush layer. The author discusses the use and efficiency of snow chains and special tires, slipperiness reducing substances such as sand, cinders, etc., the use of salts promoting melting (which have hitherto proven to be the most efficient), the organization of the scattering service, and the heating of roads as a means of prevention of slick ice surfaces as illustrated by the Frankfurt-Cologne road. *Subject Headings:* **1. Ice on highways 2. Road traffic 3. Icing conditions.**—*I.L.D.*

FOG

See: **Fog drop measurement** (Bricard et al.), 11.11–108; **Fog nucleation** (Pollak, Metnieks), 11.11–114; **Frontal effects on fog forecasting** (Mishutin), 11.11–164.

CLOUDS

See: **Cloud pictures from Tiros I** (Fritz, Wexler), 11.11–85; **Cloudiness along warm fronts, Balkan Peninsula** (Martinov), 11.11–163; **Lee wave clouds** (Monteith), 11.11–219; **Cloud drop growth** (Panchev), 11.11–225; **Freezing nuclei in convective clouds** (Roulleau), 11.11–226.

PRECIPITATION

See also: **Convective rainfall, Japan** (Noguchi et al.), 11.11–125; **Precip.-vertical motion relationships** (Woffinden), 11.11–146; **Precip. along warm fronts, Balkan Peninsula** (Martinov), 11.11–163.

11.11–229 551.577:581.33

Lautzenheiser, Robert E. (*W. B. State Climatologist, Boston, Mass.*), **Tinted rain at Dunstable, Mass., June 6, 1959.** *Monthly Weather Review*, Wash., D. C., 87(6):238, June 1959. **DWB**—Brief note regarding greenish-yellow rain observed 4:00 p.m., June 6, 1959 at Dunstable, Massachusetts. During the thunderstorm the visibility was reduced to 20 ft by rain having greenish tint. Air contained a large amount of greenish-yellow pollen which was deposited on ground, roofs, and thermometer shelter to a depth of 16 in. Contents of rain gage were also green due to pollen. *Subject Headings:* **1. Green rain 2. Pollen in rain 3. Dunstable, Mass.**—*M.R.*

11.11–230 551.577.32:551.582.3(437)

Rein, František, **Proměnlivost letních srážek v Čechách a na Moravě.** [Variability of summer precipitation in Bohemia and Moravia.] *Meteorologické Zprávy*, Prague, 12(2/3):31–41, 1959. 12 figs., 15 refs. Czech and Russian summaries p. 31–32. **DWB, DLC**—Variability of monthly precipitation totals in Bohemia and Moravia is investigated for May and July. Both months are rich in precipitation; the prevailing circulation in Central Europe is meridional in May and zonal in July. Monthly precipitation totals are analyzed as follows: 1) absolute mean variability, 2) variability index (ratio of double the mean variability and normal precipitation in percent), 3) frequency of monthly totals within the limits of normal (i.e. with deviations from average not exceeding the value of mean variability) and 4) value of the smallest precipitation total which can be considered normal (average minus the absolute value of mean variability). These characteristics are calculated for some 450 stations in western Czechoslovakia for the period 1926–1950 and presented in maps. In the introductory part of the article it is shown that the characteristics of precipitation variability mostly depend on dynamic influences of an interaction between prevailing circulation and topography and on

station elevation. The variability index, however, does not depend on elevation and its distribution therefore only shows differences in dynamic influences. In July it can be assumed that most of the precipitation is of convective origin. The fact that its distribution reflects dynamic influences of circulation and topography, may be considered as indirect evidence of the author's working hypothesis suggested in another paper, that vertical velocities of small magnitude (order of cm/sec) are directly proportional to convective vertical velocities of the order of m/sec. Finally, a map is presented showing regions of western Czechoslovakia which are subject to precipitation deficiency in May and July; these regions are mostly in the lower locations, but the principal geographic region of Bohemia, the Elbe plains, is not affected by this agriculturally harmful phenomenon. *Subject Headings:* **1. Summer precipitation variability 2. Precipitation charts, Czechoslovakia 3. Czechoslovakia.**—*Transl. of author's abstract.*

11.11–231 551.542:551.547:551.557:551.577.2/3(45)

Gazzola, A. and Montalto, M., **Synoptic patterns, upper winds and precipitation over Italy in the months of November and December.** *Berlin. Freie Universität. Institut f. Meteorologie und Geophysik, Meteorologische Abhandlungen*, 9(1):105–117, **1960.** 4 figs., 5 tables. English summary p. 13. **DWB**—In order to draw attention to the effect of the geographical configuration of Italy on the circulation of the lower levels of the atmosphere, typical fields of surface pressure and typical 200 mb topographic patterns have been derived for the months of November and December of the 5 years 1953–1957. The precipitation in various parts of Italy has been studied in correlation with both the surface and upper air patterns and with the presence of jet streams; it is found that the geographical configuration has a great influence on the precipitation. It is believed that in order to obtain better results in forecasting more attention should be given to the three dimensional interpretation of the phenomena and on the evolution of pressure fields both at the surface and in the upper air. *Subject Headings:* **1. Areal precipitation distribution 2. Precipitation variations 3. Pressure fields 4. Upper air wind pressure correlations 5. Italy.**—*Authors' abstract.*

11.11–232 551.311(882):523.746 551.577.2(882):523.746

Choubert, Boris and Boyé, Marc, **Envasements et dévasements du littoral en Guyane Française.** [Silting and erosion of the coastline in French Guiana.] *Académie des Sciences, Paris, Comptes Rendus*, 249(1):145–147, July 6, **1959.** table, 9 refs. **DWB, DLC**—The contemporary silting of the French Guiana coastline seems to be caused through abnormal accumulating of water along the shore and draining off through deep cross-currents at the time of tides, particularly when easterly trade winds are rising. Formerly, this erosion was ascribed to "tide-races." In reality, silting and erosion succeed each other periodically. Causes of periodicity are not definitely established but convergence has been noted with the 11-year cycle of solar activity. The maximum silting in 1953 coincided with the latest solar maximum, whereas erosion set in again during the spring of 1956. Intensity of muddy ground erosion grew during the last months of 1957, a year characterized by peak solar activity. On the other hand, influence of solar activity should not be direct but should have an effect, with an average delay of 3 years, upon the amount of precipitation which shows by turns deficit and excess on the tablelands of Guiana and in the part of the Amazon basin situated within the swaying zone of the intertropical front. *Subject Headings:* **1. Erosion 2. Silting 3. Sunspot effects on rainfall 4. French Guiana.**—*A. V.*

11.11–233 551.577.3:551.509.617:662.2:539.1

Pflugbeil, Carl (*Hamburg*), **Globale Niederschlagsabweichungen 1955–1957.** [World precipitation deviations, 1955–1957.] *Annalen der Meteorologie*, Hamburg, 8(11/12):353–357, **1959.** 2 figs., 4 refs. **DWB, DLC**—The possible relationship between precipitation during the period 1955–1957 and nuclear explosions is examined. A graph showing the mean deviations of global precipitation from the normal for 1953 to 1957 by station and month based upon CLIMAT data and the simultaneous nuclear explosions is presented. The greatest precipitation occurred during October 1955 but this precipitation cannot be associated with any nuclear explosions since the latter occurred on May 5, 1954. The second highest precipitation in March 1956 can be related formally to the nuclear explosion of Nov. 22, 1955 near Lake

Baikal. The repeated nuclear explosions of May–August 1956 were followed by months with rainfall deficits. When the annual mean of precipitation deviation by station is considered there is evident a trend in recent years of a decrease in the initial above normal global precipitation in spite of the increase in nuclear explosions. The absolute fluctuations of monthly deviations of precipitation have not altered substantially during the past 3 years. The possibility that nuclear explosion influences the general circulation is considered and it is mentioned that a single storm front moving over land liberates 1000 times as much energy as one nuclear explosion. The effect of nuclear explosions upon electrical conductivity of the atmosphere and a possible alteration of the ozone content of the upper layers has been studied by H. Byers and Donald R. Fitzgerald and by A. Schneiderov and their conclusions are summarized briefly. *Subject Headings:* **1. Global precipitation variations 2. Atomic explosion effects on weather.**—*I.L.D.*

11.11–234 551.513.2:551.515:551.577.32/37(52)

Syōno, S.; Miyakoda, K. and Manabe, S. et al. (*all, Geophysical Institute, Tokyo Univ.*), **Broad-scale and small-scale analyses of a situation of heavy precipitation over Japan in the last period of Baiu season 1957.** *Japanese Journal of Geophysics*, Tokyo, 2(2):59–103, Feb. **1959.** 22 figs., 3 tables, 19 refs., 8 eqs. **DWB.** Abstract only in *Meteorological Society of Japan, Journal*, 37(4):128–135, **1958.** Abstract reprinted as *Tokyo. Univ. Geophysical Institute, Geophysical Notes*, 12(2), **1959.** Contribution No. 24. **DWB, DLC**—The purpose of this paper is to present the detailed analyses of one of the cases of heavy precipitation which occur frequently in the last period of the rainy season in Japan. The case adopted was for 25–26 July 1957, in which typical convective rainfall occurred accompanied by violent thunder and with as much as 900 mm of rain per day in a very small area. In Pt. I are presented both the broad scale (300 km) and the small scale (30 km) analyses, and in Pt. II the small scale dynamics are discussed using abundant surface data. First, the possibility of forecasting precipitation of the convective type is examined, using the vertical current calculated from the large scale isobaric height patterns. The results show that the forecast rain amount was much less than the actual, though the rainy region was in fairly good agreement with the observed at the onset of precipitation. It is of interest that the calculated vertical current reached a maximum when the actual rain began, and then became negative even though heavy precipitation continued. Another important element for convective rain, vertical instability of the atmosphere, was discussed. It is shown that when the unstable region together with that of upward current cross the area it begins to rain. The small scale analyses are based upon the detailed data specially collected, the stations being spaced, on the average, by 30 km. The analyzed maps reveal that the zone of strong convergence of the surface wind existed at the place of heavy precipitation. Furthermore, the time series of intensities of convergence of the surface wind within a fixed domain of 80 km square were compared with the hourly amount of precipitation in the same area. These curves taken against time were remarkably parallel to each other. In Pt. II, the order of magnitude of each term of both divergence and vorticity equations was estimated using surface wind and pressure data. The result shows that the magnitude of the pressure term becomes larger compared with other terms with decreasing scale of mesh size. This would probably throw an interesting and important problem on the dynamics of meso-meteorology. *Subject Headings:* **1. Excessive rainfall 2. Convective rainfall 3. Convective rainfall forecasting 4. Vertical instability 5. Bai-u 6. Japan. I. Matsuno, T. II. Murakami, T. III. Kuta, Y.**—*Authors' abstract.*

11.11–235 551.577.37/38(5,5–012) 551.515.2(5,5–012)

*[**Drought, Typhoons, Floods, etc. in Asia and the Far East in 1958.**] *Flood Control Journal*, N. Y., June **1959.** 50 p. 5 figs. and maps, 16 tables. "Similar report for 1952, in *Ibid.*, June **1953.** 1953 report, in *Ibid.*, March **1954.** 1954, 1955, 1956 and 1957 Reports pub. in special issues of the *Journal* dated March **1955,** March **1956,** March **1957** and March **1958.**" **DWB**—The study can roughly be divided into three parts. The first deals with drought in Asia and the Far East, the second, with typhoons, storms and depressions during the year 1958, and the last, with damage done in Asia and the Far East. The countries included in the study are Burma, Ceylon, China, Malaya, Hong Kong, India, Japan, South Korea, Nepal, Pakistan, the Philippines, Thailand and Indonesia. Each country is described sep-

arately in detail. Many statistical tables are presented to show the damage caused in each country. In some cases the figures of even different parts of a country are given. Typhoons, storms and depression during the period under study along with their dates, origin and geographical area affected are listed in Table three. Their tracks are also indicated on two maps, the first dealing with the Jan.–July period and the second with the rest of the year. *Subject Headings:* **1. Excessive rainfall 2. Drought 3. Typhoons 4. Far East.**—*I.S.*

11.11–236 551.577.37/8

Green, Christine R., **Probabilities of drought and rainy periods for selected points in the Southwestern United States.** *Arizona. Univ. Institute of Atmospheric Physics, Technical Reports on the Meteorology and Climatology of Arid Regions*, No. 8, Jan. 31, **1960.** 28 p. 24 figs., ref., eq. **DWB**—This report presents the results of an investigation of rainfall and weather stations were used to compute the empirical probabilities that droughts of 5, 10, 15, 20, or 25 days or rainy periods of 3, 5, 10, or 15 days will start on any day between April 15 and Sept. 15. The results are presented graphically in smoothed form in 24 figures. *Subject Headings:* **1. Drought probabilities 2. Rainfall probabilities 3. Southwestern United States.** —*Author's abstract.*

11.11–237 551.577.37:551.515.8:551.482

Parczewski, Władysław (*State Inst. Hydrology and Met. Warsaw*), **Atmospheric situations causing sudden swelling of small rills.** *Acta Geophysica Polonica*, Warsaw, 7(1):25–33, **1959.** fig., 8 tables, 11 refs. Polish summary p. 33. **DWB, DLC**—On the basis of materials from the years 1900–1957, the frequency of appearance of rainstorms in relation to the pressure situation and to atmospheric fronts is examined. Author arrives at the conclusion that rainstorms nearly always appear in the troughs of low pressure and in the regions of cold, occluded and stationary fronts. *Subject Heading:* **1. Frontal type precipitation.**—*Author's abstract.*

11.11–238 551.509.318:551.577.37(728.4)

Portig, W. (*San Salvador*), **Der Temporal vom Ende Oktober 1957.** [The "temporal" at the end of Oct. 1957.] *Meteorologische Rundschau*, Berlin, 11(5):150–156, Sept./Oct. **1958.** 9 figs. **DWB, DLC**—The variable and unprecise meaning of "temporal" in Spain and Latin America is discussed briefly. In this study "temporal" is used in the Central American meaning—a persistent rain without electric discharges regardless of whether the rain is or is not accompanied by wind. The synoptic conditions preceding and accompanying the onset of the "temporal" over San Salvador on Oct. 25, 1957, and its continuation to Oct. 27 are analyzed with the aid of synoptic charts. Unusual characteristics of the "temporal" are explained. These include the following: a prevailing east wind while the front has moved from the north to northwest; the absence of electrical discharges in spite of the occasional shower character and the instability producing effect of cold air when usually cold front passages in San Salvador are accompanied by extensive lightning; and the restriction of the "temporal" to a limited area while both accompanying cold fronts manifest considerable displacement. A detailed analysis is made of the rainfall intensity and displacement during the "temporal" in the area covered by the "temporal." Special features unique to the 1957 temporal are noted, namely: the prevailing wind was, as a whole, moderate or even weak; and during the "temporal" the seismograph station at San Salvador recorded considerable microseismic unrest. Also the results of radiosonde ascents after the maximum of the "temporal" are analyzed. The unique nature of each "temporal" is stressed. *Subject Headings:* **1. Synoptic conditions for heavy rainfall 2. "Temporal" 3. Excessive rainfall 4. San Salvador, El Salvador.**—*I.L.D.*

11.11–239 551.511.2/3:551.577.37

Wischmeier, Walter H. (*Agricultural Eng. Dept., Purdue Univ., Indiana*) and Smith, Dwight D. (*U. S. Dept. of Agriculture, Beltsville, Md.*), **Rainfall energy and its relationship to soil loss.** *American Geophysical Union, Transactions*, 39(2):285–291, April **1958.** 4 figs., 2 tables, 13 refs. **DWB, DLC** –A relatively simple procedure is presented for computation of kinetic energy of a rainstorm from information on a recording-rain gage chart. An equation is developed describing rainfall energy as a function of rainfall intensity. The effects of

rainfall energy and its interaction with other variables are evaluated in multiple regression analyses based on data representing four soil types. Application of this information to separate the effects of rainfall from those of physical and management characteristics in plot data is discussed briefly. *Subject Headings:* **1. Kinetic energy of rainstorms 2. Rainfall intensities—soil loss relationships.**—*Authors' abstract.*

11.11–240 551.577.51:551.588.2(428.2)

Briggs, J. and Johns, J., **Variation in shower activity at Acklington.** *Meteorological Magazine*, London, 89(1051):48–51, Feb. **1960.** 2 figs., 2 tables. **DWB, DLC**—Although the main features of the shower activity at Acklington can readily be explained in terms of the influence of the surrounding hills and sea there are one or two points of interest. In particular the suggestion of a morning maximum, for showers with northerly winds in the winter months, is confirmed. This can be a useful forecasting guide, especially in Feb. Similarly the indication of renewed shower activity towards dusk seems of value. *Subject Headings:* **1. Orographic effects on precipitation 2. Shower formation 3. Acklington, Eng.**—*Authors' summary.*

RAIN, SNOW AND HAIL

See also: **Snow measurement techniques** (Levi), 11.11–104; **Snow melt intensity** (Onufrienko), 11.11–126; **Hailstorms, Strasbourg** (Jalu), 11.11–161; **Freezing of supercooled water** (Berry), 11.11–222; **Terminal velocity of drops** (Panchev), 11.11–223; **Snow drifts, Transbaikal** (Chichagov), 11.11–258.

11.11–241 534.321.9:551.578.11:629.13

Supersonic raindrops. *Shell Aviation News*, (English ed.), London, No. 254:9–13, Aug. **1959.** 12 photos. **DWB**—Considerable deformation of, and damage to, the solid surfaces of aircraft during high-speed flights has become a problem of great concern. "Rain erosion" has been the main cause of the problem. In this report the major aspects of this physical phenomenon are described and discussed as a result of the investigations which have been conducted in the U. S. by ENGEL and in Great Britain by JENKINS. The intensity of impact that is created on the aircraft by the supersonic raindrops is illustrated by various photographs. *Subject Headings:* **1. Raindrop erosion 2. Rainfall effects on jet aircraft 3. Supersonic raindrops.**—*N.N.*

11.11–242 551.578.41:551.574.1

Higuchi, K. (*Faculty of Science, Hokkaido Univ., Sapporo*), **Determination of the crystal face of ice by projection method.** *Meteorological Society of Japan, Tokyo, Journal, Ser.* 2, 35(4):254–256, Aug. **1957.** fig., 2 tables, 9 refs. **DWB, DLC**—The ice crystals cut from a variation of a hexagonal column with a plane are examined from the viewpoint of the Miller face indices and other characteristics. A variation of crystal faces depends on whether the cutting plane is a single crystal face or a surface which is constituted of several crystal faces. The values of edge angles depend on the contact plane between ice crystals and the surface of the plate, though the faces of ice crystals may develop under condition of low temperature and low humidity. *Subject Heading:* **1. Ice crystal formation.**—*K.C.*

11.11–243 551.578.46(470)

Chernogorov, V. P., **Dinamika skhoda snezhnogo pokrova v basseine gornoĭ reki Pskem po dannym aerofotos "emok.** [Dynamics of the disappearance of the snow cover in the basin of the mountain river Pskem according to aerial survey data.] *Meteorologiia i Gidrologiia*, Leningrad, No. 3:35–36, March **1959.** fig., table. **DWB, DLC** During the snow melt period of 1956 aerial surveys were made of the snow cover in the high mountain region of the Pskem River basin (Chirshik River basin) over an area of 1573 km². In order to avoid errors arising from large scale effect a special method of snow amount determination was developed. The area of each planchette of a photo pattern was divided into a series of sections by boundaries which either were imposed contours or a complex of lines with extended lines of frames of trapezoids and water streams; then the depth of snowiness of each section (in percent) was determined visually; and after this all the sections were transferred to a blank map having a

scale 1:100,000. The latter was superimposed upon a base map of the scale that would provide the best qualitative transfer of the given sections. Sections of the planchettes of the photo patterns were transferred to a map and then planimetered. By using the estimated snowiness one determined the area occupied by snow within each section by multiplying the area of the latter by the percent of snowiness. The snowiness was determined for the territory of the basins of the Maĭdantal, Oĭganig and Chara-Alma Rivers and data are presented on the snowiness and intensity of the snow cover in the basins of these rivers during the snow melt in 1956. It is shown that the data obtained by aerial surveys can be used in hydrological computations and forecasts. *Subject Headings:* **1. Snow surveys 2. Snow melt forecasts 3. Pskem River, U.S.S.R.**—*I.L.D.*

11.11–244 551.322:539 551.578.46(98)

Kingery, W. David (*M. I. T.*), **Utilization of ice and snow in Arctic operations.** *U. S. Air Force. Cambridge Research Center, GRD Research Notes*, No. 15:43–46, April **1959.** 3 figs., table. **DWB.** Also issued as *U. S. Air Force. Cambridge Research Center, GRD Research Notes*, No. 29, Dec. **1959.** p. 117 121. 2 refs. **DWB.** Also issued in *Journal of Glaciology*, Cambridge, 3(27):577 588, March **1960.** 4 figs., 2 tables, 21 refs. English, French and German summaries p. 577. **DWB, DLC**—The use of snow and ice as engineering materials depends on ability to give better properties to compacted structures. Practical experimentations with promising results are discussed briefly here. The creep properties of ice were studied. The average rupture modulus of ice (kg/cm²) and its relative deformation after 24-hr is respectively 18 and 25, that of ice containing 5% kaolin was 23.5 and <1 and of ice with 8% fiberglass was 100 and <1. *Subject Headings:* **1. Snow and ice constructions 2. Arctic.** —*W.N.*

11.11–245 551.578.46

Wuori, Albert F., **Preliminary snow compaction field tests.** *U. S. Snow Ice and Permafrost Research Establishment, Technical Report*, 53, March **1959.** 7 p. 20 figs., 2 tables. **DWB, DLC**—The studies were conducted in the winter of 1956–57 on test lanes constructed of snow disaggregated by various rotary snowplows and compacted with rollers or vibrators. The effectiveness of each process was evaluated in terms of density increase, grain-size distribution, final hardness, and bearing capacity. Disaggregation increased the initial densities of $\gamma = 0.30–0.36$ g/cm³ to values ranging from 0.47–0.51 g/cm³. Immediate compaction of freshly disaggregated snow with a single Jackson vibrator produced a surface density of 0.57 g/cm³ while a lapse of 1 hr before compaction reduced the final density to 0.53 g/cm³. The first pass of the vibrator gave the most compaction; additional effect after 2 passes was negligible. Rolling was most effective when rubber-tired and corrugated rollers were used in sequence, achieving a density increase of 8% in the top 10 in. of snow, and best results with rolling were obtained on snow near the melting point. The strength of snow is proportional to $\gamma - 0.38$ so that the small increase in density achieved causes a great increase in strength. *Subject Headings:* **1. Snow cover compaction 2. Snow density data.**—*Author's abstract.*

11.11–246 551.578.7:061.3

Meteorological Office discussion [on] hail, Feb. 16, 1959. *Meteorological Magazine*, London, 88(1044):178–187, June **1959.** 2 figs., 17 refs. **DWB, DLC** –A report of two papers read on the subject of "hail" and the discussion thereof. D. C. Evans, the first speaker, approached the subject from the aspect of a forecaster dealing with civil aviation. His discussion highlighted points like: damage to aircraft by hail, the distribution and size of hail, and the forecasting problems involved therein. W. G. Harper, the second speaker, reported his study of hail and thunderstorms in June and July 1957, in cooperation with F. H. Ludlam. The study investigated the relationship of hail to the stage of development of cumulus and cumulonimbus clouds, and to the occurrence of lightning in them. The study also provided material for studies of the propagation and of the localization of storms. Before the general discussion Ludlam also briefly spoke. *Subject Headings:* **1. Hail. I. Evans, D. C. II. Harper, W. G.** —*I.S.*

11.11–247 551.578.71

Muchnik, V. M., **Vzgliady M. V. Lomonosova na obrazovanie grada.** [M. V. Lomonosov's views on hail formation.] *Kiev, Ukraine. Nauchno-Issledovatel'skiĭ Gidrometeorologicheskiĭ*

Institut, Trudy, No. 5:67–69, **1956.** 14 refs. **DWB, DLC**—Contains excerpts from a work by LOMONOSOV showing that he gave an explanation of hail formation which was very close to the present explanation. *Subject Headings:* **1. Hail formation. I. Lomonosov, M. V.** —*A.M.P.*

HYDROMETEOROLOGY

See also: **Water supply for plants, 11.11–1; Soil moisture movement** (Tochilov), **11.11 227; Water balance, Gabon** (Malick), **11.11–268.**

11.11–248 551.579.2:551.525.5:551.579.5

Parshin, V. N. and Morokhovets, K. A., **Analiz usloviĭ formirovaniia pritoka talykh vod v Tsimilianskoe vodokhranilishche v malovodnom 1954 g. i mnogovodnom 1955 g.** [Analysis of the development of meltwater supply to the Tsimliansk Reservoir in 1954 with scarce and 1955 with rich water supply.] *Moscow. Tsentral'nyĭ Institut Prognozov, Trudy*, No. 65:84–106, **1958.** 7 figs., 8 tables, 4 refs. **DLC**—The atmospheric and hydrologic conditions involved in the formation of the melt water inflow into the Tsimliansk water reservoir in 1954, when the spring inflow was small, and in 1955, when it was large, are analyzed. The low soil moisture content at the beginning of spring snow melt or the thawed condition of the soil under the snow cover are a necessary prerequisite for very small spring runoff in the Don River basin. The combination of very low soil moisture, small snow supply in the basin, and very slow melting of snow in 1954 caused the lowest runoff in 75 years. The depth of freezing of very dry soil does not influence spring runoff since very dry but frozen soil has the same infiltration capacity as thawed soil. In 1954 the intensity of infiltration of water into very dry but frozen soil exceeded the rate of arrival of water to the basin during slow snow melt. As a result of the relative intensity of absorption of melt waters under very dry frozen soil an ice crust does not form on the surface of such soil. In the case of very slow melting of snow and small snow supplies the snow cover over a large part of the Don Basin up to Kalach can disappear during negative mean temperature because of melting by day as in 1957. The principal condition determining the maximum coefficient of spring runoff in the Don basin is that before the start of snow melting the soil has a moisture content equal to that of field capacity and it is frozen everywhere to a depth of 30–40 cm. The warming which in addition moistens the soil and favors the formation of an ice crust is important in the formation of spring runoff. The ice crust in filling up small depressions on the surface of the basin favors a rapid flow of melt waters. Rain falling on the ice crust also flows rapidly and has a large runoff coefficient. In computing the water supply in a river basin it is necessary to add the water supply in the ice crust to that in the snow cover. In forecasting spring runoff in years with thawing it is necessary to analyze the variation in water supply in the catchment area and the formation of runoff due to thawing. When an extensive ice crust forms underneath the snow cover during thawing the moisture of cultivated soil may exceed somewhat the field capacity. Analysis of data on snow melting showed that the thawing of the soil from the top occurs after the disappearance of the snow cover but the rate of thawing is inversely dependent upon the amount of ice on the soil. Data giving the hydrological characteristics of the basin and maps with isolines of distribution of coefficients of spring runoff, distribution of water supply in the ice crust and total surface runoff during thawing and spring high water, are presented. *Subject Headings:* **1. Snow melt runoff 2. Soil moisture content 3. Frozen soil 4. Water supply 5. Tsimliansk Reservoir, Rostov Region, U.S.S.R.**—*I.L.D.*

11.11–249 551.579.4(498)

Platagea, M. and Platagea, Gh., **Distributia teritorială şi calculul debitelor maxime pluviale pe riurile din R. P. R.** [Territorial distribution and the computation of the maximum rain floods on the Romanian rivers.] *Meteorologia Hidrologia şi Gospodarirea Apelor*, Bucharest, 3(2/3):58–62, **1958.** 2 figs., 3 tables, 6 refs., 7 eqs. English summary p. 138. **DWB**—The paper gives indications on the values of the maximum specific floods due to rains on the Romanian territory. At the same time, a verification of the formulas of D. L. Sokolovskiĭ and G. A. Alekseev and their applicability for determining the maximum rain volume on the Rumanian rivers is made. *Subject Headings:* **1. Maximum floods 2. Romania.**—*Authors' abstract.*

11.11–250 551.579.5:631.43:532.6

Nemeth, E., **L'importance de la loi de filtration de Darcy à la lumière des résultats de quelques essais sur modèles réduits.** [Importance of Darcy's law of filtration as shown on results of a few reduced-scale model experiments.] (In: I.U.G.G. Association of Scientific Hydrology, **Symposia Darcy, Sept. 1956,** pub. **1957.** Vol. 2:116–127. 6 figs., 4 photos, 5 refs., eqs.) **DWB** (M79 I61sym)—Study of the filtration in water tanks has been experimentally conducted in order to observe the liquid stratification from the surface to the impermeable bottom. Five layers are established and described in detail. A comparison of the theoretical and practical results is favorable. *Subject Headings:* **1. Darey's law 2. Infiltration** —*N.N.*

11.11–251 551.579.5:631.43

Oreshkina, N. S., **Opyty po izucheniiu vodouderzhivaiushcheĭ sposobnosti fraktsii melkogo peska i krupnoĭ pyli.** [Experiments on water holding capacity of fine sand and coarse silt fractions.] *Pochvovedenie*, Moscow, No. 1:79–86, Jan. **1959.** 4 figs., 6 refs. English summary p. 86. **DLC**—The results of laboratory experiments of the water retention capacity of two fractions of quartz sand particles of 0.10–0.08 and 0.05–0.03 mm in diameter at the Dokuchaev Institute of Soil of the U.S.S.R. Academy of Sciences in 1957 are presented and commented on. It was established that the mechanism of moisture retention in columns of sorted particles of the same size is determined by the size of the particles. Some relationship of moisture migration at different degrees of moistening has been recorded within the range of the lowest to the highest water retention capacity. *Subject Headings:* **1. Soil moisture retention 2. Sand particle moisture retention 3. U.S.S.R.**—*A.M.P.*

11.11–252 551.579.5

Popov, O. V., **Les voies d'application de la loi de Darcy à l'étude de l'infiltration.** [Application of Darcy's law to the study of infiltration.] (In: I.U.G.G. Association of Scientific Hydrology, **Symposia Darcy, Sept. 1956.** pub. **1957.** Vol. 2:281–287. 2 figs., 7 refs., eqs.) **DWB** (M79 I61sym)—The Hydrometeorological Service and the Hydrological Institutes of the Soviet Union have worked on several research programs on infiltration in different basins in order to solve the problems associated with changes in the permeability of the thin strata of the medium. Air has been the major factor that influences such infiltration. An impermeable layer of air exists in any clayey stratum of the earth. The saturation of the water above this bed enhances the humidification of the upper strata and is of great importance in irrigation. Another condition with regard to the influence of air is the absence of fissures in the thin layer. These point out the possibility of applying Darcy's law to the general case of of infiltration. *Subject Headings:* **1. Infiltration 2. Darcy's law.**—*N.N.*

11.11–253 551.579.5:622.33

Siemon, Heinz, **Berechnung von Grundwasserabsenkungen unter Berücksichtigung des Grundwasserhaushaltes.** [Calculation of the lowering of the ground water table taking into account the ground water regime.] *Deutsche Gewasserkundliche Mitteilungen*, Coblenz, 2(3):63–71, June **1958.** 5 figs., table, 6 refs., 28 eqs.—This paper is excerpted from the author's dissertation and includes additional material directly related to Germany's comprehensive program of lowering the ground water in order to mine more brown coal from great depths. The problems are treated in a clear mathematical manner and several formulas departing markedly from commonly used ones are introduced and discussed as to their applicability, particularly in relation to several important aspects of West Germany's immediate hydrological problems. *Subject Headings:* **1. Ground water lowering 2. Coal mining 3. Germany.**—*W.N.*

CLIMATOLOGY AND BIOCLIMATOLOGY

CLIMATOLOGY

11.11–254 551.58:519.2 551.511.6:551.551

Panchev, St., **Prilozhenie na niakoi statisticheski metodi za izuchavane na turbulentnite dvizheniia v klimatologiiata.** [Application of statistical methods to the study of turbulent

motions in climatology.] *Khidrologiia i Meteorologiia*, Sofia, No. 2:64–70, **1957.** 2 figs., 12 refs., 22 eqs. **DLC** (Slavic)—The statistical turbulence theory developed by A. N. Kolmogorov and A. M. Obukhov, and especially its application to climatological analysis by M. I. Iudin are reviewed. Other authors of the Russian school (Tatarskiĭ, Drozdov, Zavariva, Gandin, Iaglom) are also quoted. *Subject Headings:* **1. Statistical methods in climatology 2. Turbulence theories.**—*G.T.*

11.11–255 551.58:551.4

Stringer, E. T. (*Dept. of Geography, Univ. Birmingham*), **Geographical meteorology.** *Weather*, London, 13(11):377–384, Nov. **1958.** 12 refs. **DWB**—The author suggests the establishment of a new division of meteorology—Geographical Meteorology—which would be cultivated by geographers, since the term "climatology" for that part of geography which deals with the atmosphere is no longer suitable and since meteorology needs local field investigations. The task of the geographer is to make maps of the various topographical factors influencing local climate so that physical principles of meteorology can be applied. Geographical meteorology can be defined as the study of those factors and processes through which the earth's topography affects the atmosphere and it is the study of local and regional combinations of factors and processes and the characteristic climate and weather situations they produce within specific regions and localities. The study is carried out by the geographic method. This involves the preparation of maps of fundamental topoclimatic factors such as aspect, albedo, surface roughness, thermal conductivity, etc. To accomplish this satisfactorily the geographer's training in meteorology and climatology must be improved. The various ways in which geographers may add to meteorological knowledge, the preparation of medium and large scale maps to show local climate and topoclimate in a mesoclimate, the physical analysis of climate, the concept of a "unit climate," etc., are discussed. A table listing the chief topoclimatic factors which are to be mapped is given in an appendix. *Subject Heading:* **1. Geographical meteorology.**—*I.L.D.*

CLIMATE OF PARTICULAR PLACES

See: **Climate, Armenian S.S.R.** (Bagdasarian), 11.11–11; **Climate, Khanka Valley** (Stotsenko), 11.11–12; **Climate, Brazil,** 11.11–17; **Climate, Hungary,** 11.11–18; **Climate, Antarctica,** 11.11–21; **Typhoon charts, W. Pacific,** 11.11–158.

CLIMATIC CHANGES

11.11–256 551.583.3:551.311.1

†Paschinger, H., **Klimamorphologische Studien im Quartär des alpinen Inntals.** [Climatic-morphological studies on the Quaternary period of the Alpine Inn Valley.] *Zeitschrift für Geomorphologie*, Berlin, n. s., 1(3):237–270, Dec. **1957.** 78 refs. German and English summaries p. 265–268. **DWB**—Sedimentary terraces up to 750 ft thick, consisting in places of solid rock but mostly of clay, sand and gravel, and underlain by moraines, are explained in terms of climatic changes. The author contends that the cold, moist early glacial solifluction period was more important morphologically than glaciation itself, which was only a short episode during a prolonged cold period. The dissection of the Inn Valley terraces deposited during the cold period was brought about by a sudden change to warm-moist climate following the glacial period. It does not appear necessary to assume earth movements in order to explain the formation and dissection of deposits in Alpine valleys. *Subject Headings:* **1. Quaternary climates 2. Climatic morphology 3. Inn Valley.**—*G.T.*

11.11–257 551.583.3

Roosma, Aino (*Sloan-Kettering Inst. for Cancer Res., N. Y.*), **A climatic record from Searles Lake, Calif.** *Science*, Wash., D. C., 128(3326):716, Sept. 26, **1958.** figs., 4 refs. **DLC**—Data concerning past climatic conditions in arid California are presented. Palynological and geological evidence point to the existence of past cooler, more moist climates and to climatic fluctuations. These have been tentatively correlated with late Pleistocene events in glaciated North America. The existence of a rather extensive woodland community at

times of more favorable moisture conditions seems to be indicated. *Subject Headings:* **1. Glacial climates 2. Climatic changes 3. Arid zones 4. Searles Lake, Calif.**—*N.N.*

MICROCLIMATOLOGY

See also: **Microclimat. periodicals, 11.11–19.**

11.11–258 551.584.31:551.578.46(572/3)

Chichagov, V. P., **Naledi i snezhniki v dolinakh Ingody i Shilki.** [Naleds and snow drifts in the valleys of the Ingoda and Shilka Rivers.] *Priroda*, Moscow, No. 7:85–86, July **1959.** fig. **DLC**—A series of naleds and snow drifts, contrasting with the greenery of young grass and foliage and the dark rocky ground of the Ingoda and Shilka River valley slopes were observed in late May 1957 in eastern Transbaikal. A detailed explanation of the origin and development of these phenomena which depend on a complexity of natural factors, including the longitudinal profile of the river, climatic and hydrological conditions, is presented by the author. *Subject Headings:* **1. Slope microclimatology 2. Frost pockets 3. Snow drifts 4. Transbaikal, Asiatic U.S.S.R.**—*A.M.*

11.11–259 551.584.65:663.25(439.1)

Berényi, Dénes and Justyák, János, **A Tokaj-Hegyaljai borospincék microklimatikus viszonyai.** [Microclimatic conditions of wine cellars of Tokaj-Hegyalja.] *Debrecen, Hungary. Tudományegyetem, Acta Universitatis Debreceniensis*, 4:287–310, 1957, issued Budapest **1959.** 8 figs., 6 tables, 9 refs. German summary.—Research started in spring of 1954 on the microclimate of wine cellars in the Tokaj region; measurements having been made in different cellars. Cellars in the Tokaj region have been excavated in the mountains and are covered by a stone or loess layer 8 to 10 m thick, to eliminate temperature variations. A draft of the cellars is given. Microclimate is determined by different measurements at 1 m above the ground in the cellars. The authors give an insight of temperature variations in the different cellars and also of the relative humidity and vapor pressure. The article ends with some considerations on the ventilation. *Subject Headings:* **1. Wine cellar microclimatology 2. Tokaj, Hungary.**—*A.V.*

CLIMATIC CLASSIFICATION

See: **Climatic classification, Khanka Valley** (Stotsenko), **11.11–12; Climatic classification, Gabon** (Malick), **11.11–268.**

BIOCLIMATOLOGY

See also: **Biological effects of radiation** (Schulze), **11.11–179; Insensible weight loss** (Hale et al.), **11.11–199.**

11.11–260 551.586:576.88

Quednau, W., **Über den Einfluss von Temperatur und Luftfeuchtigkeit auf den Eiparasiten *Trichogramma cacoeciae*.** [Influence of temperature and humidity of air on the eggs of the *Trichogramma cacoeciae* parasites.] *Biologische Bundesanstalt für Land- und Forstwirtschaft, Berlin und Brunswick, Mitteilungen*, No. 90, (**1958?**). 63 p. Price: DM 7. **DLC**—In this quite detailed paper, the author comments on and shows the different developing stages of this parasite under constant and variable temperature and variable humidity. He treats of the life span and fecundity of wasps. The results can be partially simulated with mathematical formulas. The paper shows clearly that only further investigation can bring progress in the biological defense against parasites. *Subject Headings:* **1. Bioclimatology 2. Temperature effects on parasites 3. Humidity effects on parasites.**—*A.V.*

11.11–261 551.586:591.51:613.79

Svorad, D. and Wellnerová, J. (*both, Inst. of Physiology of the Czechoslovak Acad. of Sci.*), **Temperature and air humidity as factors influencing sleep and wakefulness.** *International Journal of Bioclimatology and Biometeorology*, Leiden, Vol. 3, Pt. 4, Sec. B2, **1959.** 4 p. 3 figs., 18 refs. **DWB**—The rhythm of sleep and wakefulness is one of the basic biological factors. The aim of this work was to find out the effect of temperature and air humidity on the duration

of sleep and insomnia. The study is based on experiments carried out on male rats of the Wistar strain at the approximate age of four months. The rhythm of sleep and wakefulness was registered by an electronic actograph, i.e., a photoelectric circuit with amplifier brought into action by the spontaneous activity of the animal. The spontaneous activity was registered by an electric counter. The criteria of sleep and wakefulness depended on the frequency of spontaneous activity on the counter. During the experiments, the rats were successively exposed to variable conditions of temperature (21, 27 and 33°C) and air humidity (50, 70 and 90%). The sleep of an animal, exposed to variously warm and humid air for 24 hrs, becomes shorter the higher the humidity and temperature of air. After insomnia lasting 24 hrs and preceded by an exposure to variously warm and humid air for one hour, the soundness of sleep is increased at the rate at which air humidity and temperature is raised. Similar changes of the animal's soundness of sleep occur also in such cases where the exposure of the animal is carried out during insomnia. *Subject Headings:* **1. Psychological bioclimatology 2. Meteorological influences on insomnia.**—*A. V. and authors' abstract.*

11.11–262 551.586:591.51

Wellnerová, J. and Svorad, D. (*both, Inst. of Physiology of the Czechoslovak Academy of Sciences*), **Participation of some meteorological factors on the determination of emotional reactions.** *International Journal of Bioclimatology and Biometeorology*, Leiden, Vol. 3, Pt. 4, Sec. B2, **1959.** 4 p. 4 figs., 19 refs. **DWB**—Weather is closely related to the behavior of man, particularly to human emotionality. From experiments carried out on white rats of the Wistar strain, aged approximately 4 months, the authors tried to find out the changes of emotional reactivity occurring under the influence of temperature and air humidity. Various types of tests were made: Hall's defecation test of emotionality; Hall's ambulation test of emotionality; the modified open-field test and the timidity test; their peculiarities are explained briefly. The animals were successively exposed to variable temperatures (21, 27 and 33°C) and air humidity (50, 70 and 90%) and each time their emotional reactivity was estimated. Increased temperature and air humidity increases more or less expressively the emotional reactivity. It was further stated that interindividual differences of emotional behavior are maintained in conditions of lower levels of variously warm and humid air. *Subject Headings:* **1. Psychological bioclimatology 2. Meteorological influences on emotional reactions.**—*A. V. and authors' abstract.*

11.11–263 551.586:612.014.4

Liman, St. (*Forschungs-Institut für Balneologie und Klimatologie in Poznan, Poland*), **Die Bioklimatologie des Menschen in Polen.** [Human bioclimatology in Poland.] *International Journal of Bioclimatology and Biometeorology*, Leiden, Vol. 3, Pt. 7, Sec. C, **1959.** 6 p. **DWB**—Description of research made in the different Polish institutions with an introduction defining the status of this research before World War II and its development after the war. The physical section of the studies now carried out includes measurements of the degree of refrigerations, of solar radiation (including ultraviolet radiation), of atmospheric electricity, of the ozone content near ground level and of the radioactivity of the air. Microclimatological studies are also made in view of the problems to be considered in town planning. *Subject Headings:* **1. Human bioclimatology 2. Progress in human bioclimatology 3. Poland.**—*A. V.*

11.11–264 551.586:612.014.43

Ledwina, W. (*Austria*), **Im Gleichgewicht der Wärme und der Wärmestrahlung.** [Equilibrium between heat and thermal radiation.] *International Journal of Bioclimatology and Biometeorology*, Leiden, Vol. 1 (Pt. 4, Human Bioclimatology), **1957.** 2 p. 2 refs.—In the equilibrium of heat and heat radiation, there are present conditions which do not disturb the heat regulation process. The naked body with heated outer shell is in a state of equilibrium between heat and heat radiation when it is surrounded by air with a temperature of 32°C, low relative humidity and surrounded by walls with a radiation temperature of 38°C with the head in a temperature of 18–24°C so that the inspired air has the same temperature. The body loses heat by conduction radiation and evaporation and receives an equal amount of heat by radiation from the walls. When the air temperature rises above 35°C the body becomes subject to heat stress. In the equilibrium of heat and heat radiation a change occurs

in the heat regulation situation as a result of the removal of stress on the heat regulating mechanism. Measurements show that in such an environment the skin temperature is equalized and it approaches the core temperature. Regulation to protect the core temperature becomes superfluous. The increased capillary volume of the extremities and skin is not subject to any stimuli so that the autonomic nervous system is rendered quiet. The oxygen consumption is thus considerably less than during usual metabolic conditions during equilibrium between heat and heat radiation, also the blood pressure reaches a lower level than during bed rest. *Subject Headings:* **1. Heat effects on man 2. Body heat regulation.**—*I.L.D.*

11.11–265 551.586:612.39:613.25(98)

Masterson, J. P.; Lewis, H. E. and Widdowson, E. M., **Nutrition and energy expenditure during a polar expedition.** *Polar Record*, Cambridge, Eng., 9(59):135–137, May **1958.** 3 tables, 3 refs. **DLC**—Investigation of energy intake and expenditure of men doing hard sledging carried out on the British North Greenland Expedition, 1952–1954. Three problems were studied: the energy balance of men (1) living at the base hut, (2) while sledging 6–8 hr per day in −20°C, and (3) the body's utilization of the high fat diet during the sledging. The intake of 280 g. fat per day was absorbed by 96.8 and 96.3% hence the controlled human waste so eagerly consumed by the sledge dogs must be due to liking rather than nutritional value. A mean calorie intake of 4770 during the sledging test suggests a daily ration of 4800 calories rather than ration of 4200 calories a day used previously. The results are given in tables. *Subject Headings:* **1. Human bioclimatology 2. Nutrition 3. Energy balance of man 4. Polar expeditions.**—*W.N.*

11.11–266 551.586:612.39:613.25(08)

Morrison, S. D., **Nutrition and climatic stress.** *Nature*, London, 181(4624):1644–1645, June 14, **1958.** **DWB**—At a symposium on **Nutrition and Climatic Stress** held by the Nutrition Society on April 26, 1958 at the Hannah Dairy Research Institute in Ajo, steps were taken to outline the interaction of climatic stress and nutrition. This is in the field of energy exchange. Details of the discussions are reported in this paper. *Subject Headings:* **1. Climatic stress-nutrition relationships 2. Nutrition.**—*N.N.*

11.11–267 551.586:61:016

†**Bibliography on human bioclimatology.** *International Journal of Bioclimatology and Biometeorology*, Leiden, Vol. 3, Pt. 4, Sec. E, **1959.** 30 p. **DWB**—An alphabetically (by author) arranged bibliography of articles on human bioclimatology. The bibliographical references are grouped under two headings entitled: general physiological bioclimatology (288 items) and acclimatization bioclimatology (598 items). The material of this bibliography is made up of bibliographical references supplied to the secretariat by the members of the Society. *Subject Heading:* **1. Bibliography on human bioclimatology.**—*A.V.*

11.11–268 551.586:63 551.573:551.579:551.585(672.1)

*Malick, M., **Applications des méthodes de Thornthwaite à l'étude agronomique des climats du Gabon.** [Applications of Thornthwaite's methods to the agronomical study of the climates of Gabon.] *France. Météorologie Nationale, Monographies*, No. 16, Nov. **1959.** 83 p. figs., charts, tables. **DWB**—This monograph includes 4 parts: Pt. I is concerned with definitions, measurements and calculations of evapotranspiration and potential evapotranspiration. The drawing up of the charts of normal evapotranspiration in Gabon is based on climatological observations made at some fifteen stations. The annual normal potential evapotranspiration varies from 1200 to 1500 mm. Minimum monthly normals appear in July and fluctuate between 70 and 100 mm, whereas the maximum monthly normals appear in March and April and are between 110 and 170 mm. Pt. II deals with the water balance and the climates of Gabon. After defining the factors: coefficients of humidity, ratio of humidity, ratio of aridity and global index of humidity, the author establishes a classification of the climates of Gabon after Thornthwaite's formulas. Tables and graphs show the evolution of the water balance for various stations of Gabon; charts indicate the annual distribution of the global index of humidity, the ratio of humidity, the ratio of aridity, etc. Pt. III treats of the annual variation of the crop climate. Pt. IV constitutes an attempt at classification

and agronomical definition of dry seasons and periods; it considers the introduction of evapotranspiration in the agronomical definition. *Subject Headings:* **1. Agricultural meteorology 2. Evaporation and evapotranspiration data 3. Water balance 4. Climate classification 5. Gabon, French Equatorial Africa.**—*A.V.*

11.11–269 551.586:631.548

Cavanillas, Luis, **Quantité d'eau nécessaire pour l'arrosage.** [Water quantity required for spraying.] *La Technique de l'Eau*, Brussels, 13(150):37–38, June **1959. NN, ICJ**—Review of Schofield's, Dennan's and Thornthwaite's theories. Water quantities required for spraying are determined principally by the climatic conditions of the region under consideration. Water quantity required for spraying can be determined only by a technical study combining all the possible variables. These variables are dependent, for each plant, on quality of soil, quantity of water, atmospheric factors, and tillage operations. *Subject Headings:* **1. Spraying 2. Water influence requirements for spraying 3. Tillage operations.**—*A.V.*

ENVIRONMENTAL INFLUENCES

See: **Orographic effects on cold fronts** (Petkovšek), 11.11–166; **Orographic effects on rainfall** (Briggs, Johns), 11.11–240.

MISCELLANEOUS

OPTICAL PHENOMENA

See also: **Sec. D5,** p. 1781; **Noctilucent clouds, 11.1–2; Electrostatics associated with equatorial electrojet** (Zmuda), **11.11–62.**

11.11–270 551.593.1:535.314

Rodney, W. S. and Djurle, E. (*both, Inst. of Optical Res., Stockholm, Sweden*), **Infrared phase-contrast refractometer.** *Optical Society of America, Journal*, 48(6):388–389, June **1958.** 2 figs., 6 refs. **DWB, DLC**—A phase contrast refractometer for measurements in the infrared has been constructed. The optical and mechanical arrangement is discussed and a brief description of the experimental procedure is given. A value for $(n-1)$ of air of 0.00026834 was obtained for the 1.014-μ line of mercury. The standard deviation of the mean is $\pm 0.7\%$. *Subject Heading:* **1. Refractometers.**—*Authors' abstract.*

11.11–271 551.593.54:535.417

Hinzpeter, Hans, **Erfahrungen uber Trubungsbestimmungen mit interferenzfiltern.** [Experiments on turbidity determinations with interference filters.] *Zeitschrift für Meteorologie*, Berlin, 11(10/11):330–339, Oct./Nov. **1957.** 4 figs., table, 8 refs., eqs. **DWB, DLC**—The difficulties inherent in measuring atmospheric extinction of radiation by dust or haze with the aid of actinometric measurements and the Lambert-Bouguer equation, modified by ÅNGSTRÖM'S attempt to represent the extinction coefficient of dust as a value independent of wave lengths are reviewed. The construction of a metal interference actinometer for determining accurately the wave length exponents is described with the aid of diagrams. The filter disk contained filters with wave lengths of 380, 450, 500, 580 and 600 mμ selected so that the measurements would remain outside the water vapor absorption region. The determination of the wave length exponents involved the construction of a log a_D—log λ diagram (since $a_{\lambda,D}=\beta\lambda^{-\alpha}$ and hence $\log a_{\lambda,D}=\log\beta-\alpha\log\lambda$) in which all extinction coefficients lie on a straight line when α is equal to a constant. This diagram for determining extinction coefficients together with specific examples and a table giving the results of measurements are presented. The values of α range between 0.9 and 1.5 with a mean of 1.1. The values obtained are compared with these of JUNGE. The variation of extinction curves with aerosol clouds and the importance of aging of the interference filters are discussed. *Subject Headings:* **1. Turbidity calculations 2. Interference filters 3. Extinction coefficient.**—*I.L.D.*

11.11–272 551.593.5/6

Volz, F., **Die Typen des Himmelsstreulichtes: Anleitung zur Beobachtung des dunstgetrübten Himmels.** [Types of diffuse sky light: guide to the observation of sky made turbid by haze.] (In: International Radiation Conference, Davos, 1956, **Papers. 1956.** (No. 12) 7 p. Mimeo.) **DWB** (M21.1 161pa)—Light and color distribution in the sky near the sun is a simple and sensitive means of observing atmospheric turbidity characteristics. This paper contains detailed descriptions of the various sky color and halo phenomena and practical instructions for their observation and reporting. *Subject Headings:* **1. Sky light color 2. Turbidity.**—*G.T.*

11.11–273 551.593.63:778.3

Haupt, H. (*Sonnenobservatorium Kanzelhöhe, Universität Graz*), **Beobachtung und relative photometrie einer Lichtsaule.** [Observation and the relative photometry of a halo.] *Wetter und Leben*, Vienna, 9(1/2):19–21, **1957.** fig. (photo), ref. **DLC**—A description of the observation of a halo which did not interfere with observation of the corona. The sky conditions associated with the halo and the photographing procedure are described and the picture is reproduced. *Subject Heading:* **1. Halo photography.**—*I.L.D.*

ELECTRICAL PHENOMENA

See: **Ionospheric electron density distribution** (Aikin), 11.11–48; **Ionospheric ionization** (Egan), 11.11–51; **Satellite ionospheric electron density measurement** (Little, Lawrence), 11.11–54; **Electrostatics associated with equatorial electrojet** (Zmuda), 11.11–62; **Electron scattering** (Lorents, Cook), 11.11–178.

ACOUSTICAL PHENOMENA

11.11–274 551.596.1:551.543.6

Fisher, Fred H. (*U. Calif. Marine Phys. Lab. Scripps Inst.*), **Effect of high pressure on sound absorption and chemical equilibrium.** *Acoustical Society of America, Journal*, 30(5): 442–448, May **1958.** 11 figs., table, 6 foot-refs., 10 eqs. **DLC.** Reprinted as *California. Univ. Scripps Institution of Oceanography, Contributions*, 1958, issued **1959.** p. 325–331. *Contribution*, No. 999. **DWB** (551.46 C153co 1958)—Interest in acquiring more definite knowledge of the mechanism of sound absorption in electrolytic solutions led to this experimental investigation of the pressure dependence of this phenomenon. A technique was evolved to measure sound absorption in liquids as a function of pressure at frequencies of 100–600 kc. The following properties of a 0.5-molar solution of $MgSO_4$ were measured up to 20,000 psi at 26°C: absorption, relaxation frequency and velocity. The absorption at 20,000 psi is less than one quarter that at atmospheric pressure and the relaxation frequency remains constant at 1.2×10^6 rad/sec over this pressure interval within the estimated experimental error of $\pm10\%$. The velocity increases linearly with pressure at the rate 0.1588 m/atmos. From these data the chemical and adiabatic compressibilities are computed. In an effort to secure quantitative agreement with experimental results some new aspects of the dissociation theory are discussed. *Subject Headings:* **1. Sound absorption 2. Pressure effects on sound.**—*Author's abstract.*

11.11–275 551.596.1:534.321.9

Moore, Franklin K. and Gibson, Walter E. (*both, Cornell Aeronautical Lab., Inc.*), **Propagation of weak disturbances in a gas subject to relaxation effects.** *Journal of the Aero/Space Sciences*, N. Y., 27(2):117–127, Feb. **1960.** 4 figs., 15 refs., 77 eqs. **DLC**—A generalized wave equation is derived for sound disturbances in a gas when relaxation effects connected with, for example, molecular vibration or dissociation are important. Solutions involving discontinuous wave fronts are presented, and it is shown that, under certain assumptions, the complete wave equation reduced to a varient of the gelegraph equation. Detailed solutions are presented for disturbance fields produced by a wavy wall in flow. This study is viewed as a step in the development of a theory of small disturbances of a high-temperature gas, as is found behind the shock in hypersonic flight. *Subject Heading:* **1. Acoustical propagation.**—*Authors' abstract.*

11.11–276 550.34 551.541:551.596.1:662.2:539.1

Rocard, Yves, **Sur les signaux séismiques de courte période obtenus lors du test nucléaire de Reggane, le 13 février 1960.** [Short period seismic signals obtained during the nuclear test at Reggane on Feb. 13, 1960.] *Académie des Sciences, Paris, Comptes Rendus,* 250(11): 2041–2042, March 14, 1960. ref. **DWB, DLC**—At the time of the French nuclear explosion on Feb. 13, 1960 near Reggane, vertical short period seismographs installed in the Sahara at a distance of 686 kms recorded very clear signals. The propagation duration of the waves *P* is 7.30 s in the middle of the African continental shelf. The amplitude of the seismic pressure provoked by the aerial explosion (at an altitude of about 100 m) and that of the same explosion but under the ground are in the ratio 1/20. These seismographs received 30 or 40 min. later important and prolonged signals due to an acoustical propagation of the pressure in the air. On the other hand seismographs of the same type installed in France at a distance of 2350 kms recorded signals appreciably weaker that one would have thought according to the results obtained in America when tests were made in Nevada. The propagation from the center of the African shelf towards Europe, across the Mediterranean Sea has particularities different from those of the North-American continent. *Subject Headings:* **1. Seismic waves 2. Shock waves 3. Anomalous sound propagation 4. Atom bomb tests 5. Reggane, Sahara.**—*A.V.*

11.11–277 551.596.1:532.13 534.2

Canac, François and Merle, Marie, **Vibrations et émission sonore d'un jet d'air comprimé étudiées avec une caméra électronique ultrarapide.** [Vibrations and sonorous emission of a compressed air jet investigated by means of an ultra-rapid electronic camera.] *Académie des Sciences, Paris, Comptes Rendus,* 250(10):1795–1797, March 7, 1960. 5 figs., ref. **DWB, DLC**—Compressed air jets under various pressures have been photographed by means of an electronic camera. The quasi-continuous series of photos put into evidence a very rapid oscillation of the entire jet, the period of which can thus be determined. Analyzing the photos supplied by the electronic camera enables to get a good precision of the measurement of the oscillation frequency. Using the streaks method, the authors have photographed the emitted sound-waves and further determined the corresponding frequency. *Subject Headings:* **1. Fluid mechanics 2. Acoustical waves.**—*A.V.*

11.11–278 535.21:534.2:546.17

Hammerling, P.; Teare, J. D. and Kivel, B. (*all, Avco-Everett Res. Lab., Mass.*), **Theory of radiation from luminous shock waves in nitrogen.** *Physics of Fluids,* N. Y., 2(4):422–426, July/Aug. 1959. 4 figs., table, 16 foot-refs., 7 eqs. **DWB**—The physical properties behind a normal shock in nitrogen are calculated as a function of time. These include the variation of temperature, composition, ionization, and the intensity of radiation from the N_2+ first negative band system. This calculation incorporates a rate equation for the dissociation of nitrogen, the conservation laws, an equation describing vibrational relaxation, and a method of coupling the vibrational relaxation with the dissociation rate. The N_2+ radiation is computed assuming excitation of the radiating state by collision with vibrationally excited nitrogen molecules. A particular case is considered for which experimental data are available, and regions sensitive to particular rates are indicated. *Subject Heading:* **1. Shock waves.**—*Authors' abstract.*

11.11–279 551.596.1 530.145:534.22

Metz, André, **La déviation des ondes par le mouvement des milieux de propagation.** [Deviation of waves through movement of the propagation medium.] *Académie des Sciences, Paris, Comptes Rendus,* 248(11):1615–1617, March 16, 1959. 1 fig., 2 refs. **DWB, DLC**—Study on deviation of the waves bound to propagation media, when they pass from one of these media to another in motion with respect to the former. Account of the results, not suitable for light propagation but finding application for every wave bound to propagation media, like mechanical waves, sounds and ultra-sounds. *Subject Heading:* **1. Waves bound to propagation media.**—*A.V.*

11.11–280 551.501.7:551.596.1:551.524.7

Mordukhovich, M. I., **Lokal'nyĭ akusticheskiĭ metod izmereniia temperatury vozdukha.** [Local acoustical method of measuring air temperatures.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.,* No. 3:480–488, March 1959. 7 figs., table, 8 refs., 12 eqs. **DLC**—The acoustical

method for measuring atmospheric temperature eliminates radiational errors and reduces inertial errors. In the free atmosphere temperature can be measured from the velocity of sound by using the local method, i.e. by elevating simultaneously receivers and sources of sound which are at a small distance from each other. The local acoustical method can reveal the fine structure of the atmospheric temperature field, determine the daily temperature variation and the effect of the sun upon the temperature of the lower and middle stratosphere and establish the errors of other apparatus. Temperature is measured on the basis of velocity of sound by means of the phase method during continuous radiation of sound. The measurement of temperature is reduced to determining the time of passage, τ, by sound of the distance l between two points, $\tau = \frac{l}{C} = \frac{\sqrt{T_0}}{C_0}\frac{l}{\sqrt{T}}$ where C_0 = velocity of sound at the initial temperature T_0. The air temperature is determined from $\varphi = \frac{\omega l}{\sqrt{\gamma B/\mu}}$ where φ = shift of phase $\omega = 2\pi f$. The acoustical thermometer without excluding wind effect, the acoustical thermometer with attenuation of the wind effect, and the sources and receivers of sound are described with the aid of diagrams. The equation for measuring temperature applicable to the acoustic thermometer with attenuation of wind effect is developed, and the results of measurements are presented. The possibility of measuring atmospheric temperature to heights of 40 km is indicated. *Subject Headings:* **1. Upper air temperature measurement techniques 2. Acoustical temperature determination.**—*I.L.D.* ⑤

11.11–281 551.596.1

Reed, S. G., Jr. (*Naval Res., Wash., D. C.*), **N-wave propagating into a stratified atmosphere.** *Physics of Fluids*, 3(1):134, Jan./Feb. **1960.** 4 refs., eq.—In accordance with a discussion by LAMB of plane acoustic waves propagating straight into an isothermal stratified atmosphere, the wave amplitude shows a proportional variation to the inverse square root of the ambient density or pressure. A calculation was made using the N-wave model of DU MOND et al. to see to what extent a similar rule might hold for finite amplitude waves. The present note describes the calculation. *Subject Heading:* **1. Wave propagation.**—*I.S.*

11.11–282 551.596.1 534.2

Rosenbaum, J. H. (*Shell Development Co., Texas*), **The long-time response of a layered elastic medium to explosive sound.** *Journal of Geophysical Research*, Wash., D. C., 65(5): 1577–1613, May **1960.** 31 figs., table, 9 refs., 64 eqs. **DLC**—The long-time response of a layered elastic medium is considered for the particular case of a point-source explosion in a liquid layer lying above an infinitely deep liquid bottom. An asymptotic solution, valued for large values of the time variable, is obtained; it expresses the response in terms of harmonic vibrations of the liquid layer. Special emphasis is placed on those vibrations which correspond to waves with small angles of incidence and which, because of radiation into the bottom, decay exponentially with time. However, the well-known guided-wave phenomenon, first discussed by Pekeris in 1948, is also included in the present formulation. A detailed presentation is made of the method of analysis. This method is applicable to more complicated problems of direct geophysical interest. Numerical results are presented for some typical examples, the behavior of the phase velocity for the lower modes being of particular interest. *Subject Heading:* **1. Acoustical propagation.**—*Author's abstract.*

11.11–283 551.596.1:534.321.9:614.83

Willig, F. J. (*Univ. of Calif. Radiation Lab., Livermore, Calif.*), **Applications of high explosives in the production of extreme velocities and pressures.** (In: **The threshold of space,** ed. by M. Zelikoff. N. Y., Pergamon Press, **1957.** p. 294–299. 6 figs., 5 refs.) **DLC**—Various techniques used in obtaining extreme velocities are briefly discussed. Of particular interest is a lenticular-shaped piece of explosive of low detonation velocity embedded in another explosive of higher detonation velocity. The arrangement is analogous to a lens system. A graph shows maximum jet velocities versus atomic weight. *Subject Headings:* **1. Shock waves 2. Supersonic speeds.**—*A.A.*

Note: Two special supplements will be issued as Parts I and II of Vol. 11, No. 12, Dec. 1960.

PART II. AN ANNOTATED BIBLIOGRAPHY ON NIGHT AIRGLOW

By: Andrew J. Meglis and Ismail Saad

INTRODUCTION

The purpose of this bibliography is to consolidate a representative group of recent abstracts on airglow so that this material might be made readily available to users, thus bringing the earlier compilation in *Meteorological Abstracts* (Vol. 8, No. 2, Feb. 1957) approximately up to date. Other related night-sky phenomena (aurora, gegenschein, zodiacal and galactic light) and twilight phenomena have been omitted.

The geographic outline which follows illustrates the diversity of locations at which observations were made. Similarly, the subject outline shows the nature and scope of the material included in this bibliography.

Similar compilations on the aurora will be published in the near future thus bringing the auroral bibliographies (Vol. 4, No. 10, Oct. 1953 and Vol. 5, No. 3, March 1954) up to date.

OUTLINE OF CONTENTS

SUBJECT OUTLINE

GENERAL
- **Bibliographies,** 11K–3, –5, –8, –20, –31, –39, –41, –59, –83, –85
- **Conferences,** 11K–29, –60, –90
- **IGY,** 11K–2, –13, –29, –30, –32, –59, –75, –82
- **Textbooks,** 11K–132
- **General discussions,** 11K–3, –5, –8, –13, –20, –22, –29, –30, –31, –41, –50, –55, –60, –68, –69, –76, –83, –85, –88, –90, –94, –100, –103, –105, –119, –122, –129, –131

THEORY AND METHODS
- **Theory of**
  - Chandrasekhar, 11K–25
  - Chapman, 11K–15, –19, –140
  - Martyn, 11K–53
- **Method of**
  - Barbier et al., 11K–12
  - Hunten, 11K–54
  - Triangulation, 11K–80, –105
  - Van Rhijn, 11K–12
  - Visual observation, 11K–50

INSTRUMENTS AND EQUIPMENT
- **Instrument description,** 11K–1, –33, –35, –44, –45, –55, –56, –82, –88, –97, –98, –140
- **All-sky camera,** 11K–58
- **Cs-O-Ag photoelectric cell,** 11K–33
- **Ion chamber,** 11K–72
- **Monochromator,** 11K–34, –45
- **Photometer,** 11K–7, –14, –47, –55, –56, –57, –58, –65, –73, –80, –82, –96, –97, –98, –105, –106, –115, –116, –119, –138
  - Electrophotometer, 11K–5, –35, –136
- **Photon counter,** 11K–72
- **Rocket sounding and measurement,** 11K–13, –29, –36, –43, –47, –65, –71, –72, –105, –130, –140, –142
- **Spectrograph,** 11K–38, –55, –58, –67, –102
  - CP-50 spectrograph, 11K–39
  - Grating spectrograph, 11K–16, –74
- **Spectrometer,** 11K–45, –46, –55, –86, –95, –131, –141
  - Photoelectric Fabry-Perot spectrometer, 11K–1, –4, –101, –134, –142

VARIATIONS IN RADIATION
- **Diurnal,** 11K–3, –19, –31, –77, –80, –117, –135, –136
- **Emission temperatures,** 11K–3, –4, –8, –39, –55, –68, –74, –83, –101, –127, –134, –139
- **Intensity,** 11K–1, –10, –52, –68, –115, –135
  - Intensity distribution, 11K–18, –74, –117, –120, –130
  - Intensity measurements, 11K–8, –23, –34, –37, –38, –39, –46, –52, –56, –65, –74, –77, –78, –79, –80, –86, –88, –95, –96, –105, –106, –110, –111, –112, –113, –114, –120, –136, –137, –138
- **Latitude,** 11K–48, –56, –70, –89
- **Seasonal,** 11K–3, –8, –31, –48, –80, –89, –105, –131, –136

EMISSION ELEMENT
- **Hydrogen,** 11K–31, –54, –69, –70, –72, –86, –122, –123
- **Lithium,** 11K–6, –32, –55, –62, –73
- **Nitrogen,** 11K–16, –17, –20, –61, –128

Oxygen, 11K–15, –16, –17, –20, –61, –69, –127, –128
Ozone, 11K–63, –127, –138
Sodium, 11K–6, –25, –26, –36, –52, –54, –55, –62, –73, –96, –99, –105, –127

Spectral Analysis
Bands
N_2, 11K–42, –53, –102
Na doublet, 11K–14, –40
NO, 11K–17, –92, –114, –126
O_2, 11K–14, –16, –17, –18, –31, –46, –69, –70, –114, –120, –130
OH, 11K–3, –5, –14, –21, –31, –34, –38, –39, –46, –47, –53, –55, –69, –70, –74, –95, –98, –102, –120, –121, –130, –136, –139
Lines
Na *D*, 11K–7, –24, –26, –31, –47, –127, –140
Oxygen, 11K–11, –27, –28, –31, –42, –49, –121, –125, –126, –134
Wave lengths of bands and lines
Ultraviolet (30 Å–4000 Å), 11K–5, –16, –18, –72, –83, –84, –117, –130
1040–1350 Å, 11K–72
1400–1500 Å, 11K–128
2600–2900 Å, 11K–130
3350 Å, 11K–18
<3500 Å, 11K–84
3670 Å, 11K–14
3700–3800 Å, 11K–126
3914 Å, 11K–53
Visible (4000 Å–7000 Å), 11K–83, –84
4000–4500 Å, 11K–116
4200–6500 Å, 11K–84
4400 Å, 11K–14
4500 Å, 11K–18
5199 Å, 11K–66
5200–5300 Å, 11K–66
5210 Å, 11K–7
5260 Å, 11K–14
5300 Å, 11K–66, –137
5320 Å, 11K–140
5335 Å, 11K–47
5400–5600 Å, 11K–126
5522 Å, 11K–65
5577 Å, 11K–1, –4, –7, –12, 14, 15, 28, –31, –34, –47, –48, –56, –57, –58, –65, –69, –70, –77, –78, –79, –80, –81, –82, –84, –89, –93, –101, –105, –106, –107, –109, –110, –111, –112, –113, –129, –130, –134, –136, –137, –140, –142
5890 Å, 11K–36
5893 Å, 11K–27, –47, –65, –82, –136
5900 Å, 11K–14
6257 Å, 11K–140
6300 Å, 11K–10, –27, –47, –125, –130, –133, –134
6300 (OH) Å, 11K–14
6300 (OI) Å, 11K–14, –27, –69, –70, –81, –82, –115, –136
6363 Å, 11K–115, –125
6562 Å, 11K–104
6700 Å, 11K–14
6708 Å, 11K–6, –32, –73
7000 Å, 11K–124
Near infrared (7000 Å–9000 Å), 11K–34, –39, –83, –136
7000–8000 Å, 11K–124
8446 Å, 11K–121
8640 Å, 11K–34
8870 Å, 11K–67
Infrared (9000 Å–1 mm), 11K–3, –5, –17, –39, –83, –117, –118, –124, –141
>9000 Å, 11K–55
9000–11000 Å, 11K–118
9000–20000 Å, 11K–46
9391 Å, 11K–67
9976 Å, 11K–67
10000 Å, 11K–124
10000–40000 Å, 11K–55
10217 Å, 11K–67
10374 Å, 11K–67
10827 Å, 11K–67
11100 Å, 11K–53
11287–11299 Å, 11K–121
14000–40000 Å, 11K–95
15000 Å, 11K–53
≤21000 Å, 11K–55

Airglow Radiation Related to
Albedo, 11K–25, –57
General circulation, 11K–48, –135
Magnetic activity, 11K–79, –91, –111, –112, –135
Meteoritic currents, 11K–51
Solar activity, 11K–51, –66, –70, –89, –92, –117, –118, –121, –124
Upper atmosphere, 11K–19, –20, –27, –28, –47, –64, –72, –77, –91, –92, –93, –135

Associated Phenomena
Aurora, 11K–4, –5, –7, –15, –20, –29, –30, –35, –37, –41, –42, –46, –50, –53, –55, –58, –59, –60, –66, –70, –74, –75, –78, –80, –83, –84, –86, –88, –91, –100, –102, –109, –111, –113, –114, –117, –122, –132, –135
Twilight, 11K–5, –8, –24, –26, –27, –32, –40, –54, –62, –70, –76, –82, –83, –96, –99, –100, –115, –120, –121, –124, –132, –138

Miscellaneous
"Airglow cells," 11K–107, –108
Anomalous day-sky brightness, 11K–87
Chemiluminescence, 11K–103, –127
Determination of intensity by use of ionosphere data, 11K–10
Determination of line widths, 11K–4
Lithium emission and nuclear explosions, 11K–6, –62
Luminance standard using willemite, 11K–9
Photochemistry of upper atmosphere, 11K–20, –43

GEOGRAPHIC OUTLINE

AFRICA
Beni-Abbés, Algeria, 11K–101, –142
Tamanrasset, Algeria, 11K–11
ANTARCTIC, 11K–56, –88, –96
Adélie Land, 11K–32, –73
ASIA
India, 11K–2
Japan, 11K–2, –57, –58
Sirah Island, Aden, 11K–49
U.S.S.R.
Alma Ata, 11K–119
AUSTRALIA, 11K–2
Melbourne, 11K–96
EUROPE
France, 11K–2, –115
Haute-Provence, 11K–11, –12, –14, –15, –48, –78
Norway
Ås, 11K–73, –74
U.S.S.R., 11K–2, –39
Georgia, 11K–82
Abastumani, 11K–136
Leningrad, 11K–117
Mt. Elbrus, 11K–118
Murmansk, 11K–5, –38
Zvenigorod, 11K–120, –123
NORTH AMERICA
Canada, 11K–30
Churchill, 11K–53, –86, –55
Saskatoon, 11K, –26, –46, –53, –62, –102
Greenland
Thule, 11K–110
United States, 11K–2
Alaska
College, 11K–7, –112
California
Cactus Peak, 11K–48, –105
Mt. Palomar, 11K–105
Colorado
Fritz Peak, 11K–79, –106, –110, –111
Leadville, 11K–79
New Mexico, 11K–140
Sacramento Peak, 11K–80
South Dakota
Rapid City, 11K–81, –111
SOUTH AMERICA
Bolivia
Chacaltaya, 11K–23
OCEANS AND SEAS
Indian Ocean, 11K–49

11K–1 523.77:551.521.326:523.417

Allard, N., **Interféromètre de Fabry-Perot enregistreur pour l'étude de la raie verte du ciel nocturne.** [Recording Fabry-Perot interferometer for the study of the green night sky line.] *Journal de Physique et le Radium*, Paris, 19(3):340–341, March **1958.** fig. French and English summaries p. 340. **DLC**—A photoelectric Fabry-Perot spectrometer, designed for study of the width of the green night sky line ($^3_2$[O_1]5577 Å), is presented together with a description of the interferometer and its use as an easily portable device for the purpose of observing at different stations. (*Same item as* 10.1–237, Jan. 1959, *Met. Abstracts.*) *Subject Headings:* **1. Fabry-Perot interferometer 2. Green night sky line.**—*Author's abstract.*

11K–2 551.506.22:551.521.326

Airglow measurements during the I.G.Y. *American Geophysical Union, Transactions*, 38(6): 994–996, Dec. **1957. DWB**—A faint nightglow that occurs in the earth's atmosphere was a subject of considerable scientific interest and study during the IGY. This is a report on the airglow observational programs as conducted in France, Japan, the U.S.S.R., India, Australia and the U. S. The countries collaborating with the U. S. are also mentioned. The method adopted for this study is discussed. Observers have noted, among other facts, some intensity variations. *Subject Heading:* **1. IGY airglow program.**—*N.N.*

11K–3 551.521.326

†Andrillat, Y. (*Lyons Obs.*), **Les bandes de vibration-rotation de la molécule OH dans le spectre infrarouge du ciel nocturne.** [Molecular OH vibration-rotation bands in the infrared spectrum of the night sky.] *Journal de Physique et le Radium*, Paris, 17(5):442–448, May **1956.** 39 refs., eqs. **DLC**—A review article in which the author discusses the vibration-rotation bands of the OH molecule in the infrared night sky spectrum (discovery in 1944 by STEBBINS, WHITFORD and SWINGS), lists of observations of bands, theoretical results and comparisons of observed and calculated bands by various authors, laboratory data, studies of intensities, temperatures, heights, diurnal and seasonal variations and emission mechanisms. A good bibliography is included. (*Same item as* 8.10 155, *Met. Abstracts.*) *Subject Headings:* **1. Night airglow research 2. Night airglow infrared spectra.** —*M.R.*

11K–4 523.77:551.521.326:551.594.5

Armstrong, E. B., **Largeur de la raie OIλ5 577 du ciel nocturne et des aurores.** [Width of the line OIλ5 577 of the airglow and aurorae.] *Journal de Physique et le Radium*, Paris, 19(3):358–365,

March 1958. 7 figs., 2 tables, 14 refs. French and English summaries p. 358. **DLC**—Observations of the OI green line profiles in the airglow and auroras, made with a photoelectric Fabry-Perot interferometer, are described. The temperature of the region emitting the airglow radiation appears to be between 180°K and 220°K, the most likely value indicated being 190°K. Auroral regions emitting the green line appear to range in temperature from 255°K to 540°K. A method of estimating line widths from fringes in the presence of background light is described. (*Same item as* 10.1–238, *Met. Abstracts.*) *Subject Headings:* **1. Fabry-Perot interferometer 2. Airglow 3. Auroras.**—*Author's abstract.*

11K–5 551.521.326 551.594.51:551.590.21

†Bagariatskiĭ, B. A., **Raboty sovetskikh uchenykh po svetimosti nochnogo neba i poliarnykh siianii.** [The work of Soviet scientists on the night airglow and the polar auroras.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 11:1410–1417, **1957.** 118 refs. **DWB**—Soviet research on night airglow, twilight luminescence of the atmosphere and auroras during the past forty years is reviewed. In the 1920's, FESENKOV developed the method of "twilight photometry"; VUKS and CHERNIAEV in 1937 observed the fluorescence of the atmosphere in the form of sodium flashes. The role of repeated scattering in twilight phenomena, the twilight flash of oxygen lines and the explanation of the latter by the selective refraction of solar radiation in the atmosphere constitute some of the lines of study of twilight phenomena. The study of night airglow includes the development of new apparatus, research on the ultraviolet region, etc. After World War II, V. I. KRASOVSKIĬ investigated the infrared emission of the night sky and the mechanism of disturbance of hydroxyl glow. The energy distribution of the night sky was investigated with the aid of electrophotometers and light filters. In 1950–1952 the Institute of Terrestrial Magnetism organized in Murmansk the first station for auroral studies under the direction of S. I. ISAEV. Two other stations have been established to study the relationship of auroras to solar activity. The theory of the interrelationship of solar corpuscular flux to the atmosphere and magnetic pole of the earth has been investigated by A. I. LEBEDINSKIĬ and others. (*Same item as* 10.6–202, *Met. Abstracts.*) *Subject Headings:* **1. Night airglow 2. Twilight luminescence 3. Auroral-solar relationships.**—*I.L.D.*

11K–6 551.521.326

Barber, D. R. (*Norman Lockyer Observ., Univ. Exeter, Salcombe Hill, Sidmouth*), **Origin of upper-atmosphere lithium atoms responsible for the new twilight airglow at 6708 Å.** *Nature*, London, 183(4658):384, Feb. 7, **1959.** 8 refs. **DLC**—Facts and previous investigations of the characteristics of lithium-sodium clouds are considered. Several factors related to these clouds, such as air density at 80 km, its viscosity at 190°K, and the meteoritic dust, vary respectively in density, estimated at 2.5×10^{-8} gm/cm³, in viscosity, known to be 1.2 gm/cm/sec, and in the meteoritic dust density estimated at 3.5 gm/cm³. When these relative values of the measured intensity of the ratio of lithium-sodium clouds are used in Stoke's equation, a mean particle diameter of 5.4μ is obtained for the individual atom. Report discusses the physical and chemical results of the nuclear detonation of Aug. 1, 1958 and the lithium airglow emission observed in Oct. 1957 and Aug. through Sept. 1958. Five days after the Aug. detonation in 1958 the first twilight of lithium radiation was observed. This and the latter observations reveal that the emissions were man-made and had little to do with the passage of meteoritic dust through the earth's upper atmosphere. Therefore, the previous hypothesis suggested in *Academie des Sciences, Paris, Comptes Rendus*, 247(11):806–807, Sept. 15, **1958** becomes invalidated. *Subject Headings:* **1. Twilight airglow 2. Lithium in upper atmosphere 3. Nuclear explosion effects on upper atmosphere.**—*N.N.* Ⓢ

11K–7 551.521.326 551.594.5

Barbier, Daniel and Pettit, Helen, **Photometric observations of the airglow and of the aurora borealis at College, Alaska.** *Annales de Géophysique*, 8(2):232–247, April/June **1952.** 7 figs., 6 tables, 12 refs., eqs. French and English summaries p. 232. **DWB**—Observations made at College, Alaska in February 1949 with a photometer designed by F. E. ROACH are discussed with special attention to the corrections for scattered light. The results are as follows. Airglow: The intensity of the green line is about the same as is found in regions of moderate latitude while the D line and λ5210 are much weaker. Aurora borealis: Most of the observations of the green line indicate a height of 135 km, but a few give 750 km. The other two radiations seem to be emitted at high altitudes. Some indication of the macroscopic structure of the observed aurorae is given. (*Same item as* 5C–257, *Met. Abstracts.*) *Subject Headings:* **1. Night airglow 2. Auroras 3. College, Alaska.**—*Authors' abstract.*

11K–8 551.521.326

†Barbier, D., **The airglow.** (In: Beer, Arthur (*ed.*), **Vistas in astronomy.** London, Pergamon, **1955.** Vol. 2:929–939. numerous refs.) **DLC** (QB3.B35). Also issued as *Institut d'Astrophysique de Paris, Contributions, Ser. B*, No. 108. **CU, NNA**—The status of the problem of the air-

glow is reviewed; the observational point of view is particularly emphasized. The author examines successively the instruments, the spectrum of the nightglow, the heights of airglow emissions, the temperatures of the emitting layers, the absolute intensities of the nightglow radiations, the polarization of the nightglow lines, the seasonal variations of nightglow intensity, the theoretical interpretation and the twilight glow. (*Same item as* 10.2–218, *Met. Abstracts.*) *Subject Headings:* **1. Airglow radiation 2. Night airglow 3. Seasonal airglow intensity variations.**—*Author's abstract.*

11K–9 551.593.5:551.521.326

Barbier, D. and Lévêque, P., **Etalon de faible luminance pour l'étude de la lumière du ciel nocturne.** [Weak luminance standard for nightglow study.] *Revue d'Optique*, Paris, 36(3):132–134, March **1957.** fig. **DLC.** Also issued as *Institut d'Astrophysique, Paris, Contributions, Ser. A*, No. 221. **CU, NNC**—A luminance standard consisting of willemite excited by strontium 90. *Subject Heading:* **1. Photometric night airglow measurement.**—*A.V.*

11K–10 551.521.326:535.3

Barbier, Daniel, **Observations de la luminescence atmosphérique nocturne de la raie rouge de l'oxygène.** [Observation of the red line of oxygen in the nightglow.] *Académie des Sciences, Paris, Comptes Rendus*, 244(13):1809–1811, March 25, **1957.** 4 refs. Also his: **Interprétation de la luminescence nocturne de la raie rouge de l'oxygène.** [Interpretation of the red line of oxygen in the nightglow.] *Ibid.*, 244(15):2077–2080, April 8, **1957.** 2 figs., 7 refs. **DLC**—Nightglow intensity (6300 Å) was measured at a 75° zenith angle in a complete circle. Intensity variations throughout the night are discussed in the first paper. In the second paper, an empirical formula is presented which makes it possible to calculate the approximate intensity of nightglow during the earlier part of the night on the basis of ionospheric data. During the later part of the night the analysis of observations is complicated by an additional phenomenon, possibly the invasion of Arctic air. (*Same item as* 9.9-182, *Met. Abstracts.*) *Subject Headings:* **1. Night airglow intensity variations 2. Night airglow spectrum.**—*G.T.*

11K–11 551.521.326

Barbier, Daniel, **La lumière du ciel nocturne en été à Tamanrasset.** [Nocturnal sky light at Tamanrasset during summer.] *Académie des Sciences, Paris, Comptes Rendus*, 245(18):1559–1561, Oct. 28, **1957.** 2 tables, 3 refs. **DLC**—The behavior of nocturnal sky light is passably different at Tamanrasset and in Haute-Provence. A particular phenomenon manifested through the red line has been displayed at the first mentioned station. (*Same item as* 10.1–239, *Met. Abstracts.*) *Subject Headings:* **1. Nocturnal sky light 2. Tamanrasset, Algeria.**—*A.V.*

11K–12 551.521.326

Barbier, Daniel and Glaume, Jeannine (*both, Institut d'Astrophysique de Paris et Observatoire de Haute Provence*), **Nouvelle determination de l'altitude d'emission de la raie verte de la lumiere du ciel nocturne par la methode de Van Rhijn.** [New determination of the emission altitude of the green line in the night airglow by the Van Rhijn method.] *Annales de Géophysique*, Paris, 13(4):317–320, Oct./Dec. **1957.** 2 figs., table, 9 refs., eqs. **DLC**—A new series of observations and measurements at the Haute-Provence Observatory began in 1954. Using statistical methods (Barbier et al., 1951), it is shown that the green line of the airglow is emitted at low altitudes. The data plotted and tabulated show determination of the values of the coefficient of altitude $\gamma = 2.44$, etc. at $\gamma = 2.73 = 60$ km. The altitude of the order of 100 km seems most reasonable. *Subject Headings:* **1. Night airglow layer heights 2. Green line emission.**—*Z.S.*

11K–13 551.521.326

Barbier, Daniel, **La lumière du ciel nocturne.** [Light of the night sky.] *L'Astronomie*, Paris, 70:449–454, Dec. **1957.** fig. **DWB**—A semipopular article on the night airglow, its properties and its spectrophotometry. The idea of the "light of the night sky" is credited to Simon Newcomb, who (*Astrophysical Journal*, 1901) attributed it to background illumination from invisible stars of countless numbers. Later it was thought to be a "zodiacal light" type of illumination, but recently it has been considered mainly a luminescent phenomenon of the high atmospheric layers. Causes, mechanisms, artificial production by emissions from rockets and IGY program are mentioned. *Subject Headings:* **1. Night airglow. I. Newcomb, Simon.**—*M.R.*

11K–14 551.521.326:535.33

†Barbier, Daniel and Glaume, Jeannine, **Corrélations entre les intensités de diverses radiations de la luminescence atmosphérique nocturne.** [Correlations between the intensities of various radiations of the nocturnal atmospheric luminescence.] *Annales de Géophysique*, Paris, 16(1):56–76, Jan./March **1960.** 7 figs., 5 tables, 20 refs. French summary. **DLC**—An eight-color photometer has made it possible to obtain at the Haute-Provence Observatory, since July 1953, the

intensities of nocturnal light through eight filters: 6700, 6300 (narrow), 6300 (wide), 5900, 5577, 5260, 4400, 3670. The four last radiations (group A) are co-variant and show a very great correlation among themselves. With the 6300 (narrow) and 6300 (wide) filters one gets the intensities of 6300 (OI) and 6300 (OH). The radiations 6700, 6300 OH and 5900 form a group B in which one also finds co-variation and correlation properties. Only small relations exist between the radiations of groups A and B. 6300 (OI) does not depend on these two groups. Evidence of contamination effects exists: a band of OH is admitted by the 5260 filter. The 6700, 6300 OH, 5900 and consequently 5577 measurements are affected by the presence of a continuous spectrum. Formulas are established to correct the observations of these effects. It is possible to account theoretically for nonproportional correlations between the intensities of the green line, the Herzberg bands and the continuous spectrum. It is not yet possible to state whether the correlation between the intensities of the sodium doublets and of the OH bands are or are not proportional. *Subject Headings:* **1. Night sky luminescence 2. Night sky spectrum 3. Haute-Provence Observatory, France.**—*Transl. of authors' abstract.* Ⓢ

11K–15 551.594.5:551.521.326:546.21

Barbier, Daniel, **Origine de (OI)5577 dans la luminescence nocturne et dans l'aurore.** [Origin of (OI)5577 in night sky luminescence and in an aurora.] *Annales de Géophysique*, Paris, 16(1):143–147, Jan./March **1960.** 2 figs., table, 5 refs. **DLC**—The aurora and night sky luminescence present spectral, morphological and other differences which divide them into two distinct phenomena. Especially, the emission of 5577 in the aurora and in the night sky luminescence are two distinct phenomena which may be separated through observation. In low geomagnetic latitude stations such as the Haute-Provence Observatory the auroral component is always very feeble, except fairly low on the horizon, and its appearance is quite exceptional. The dissymmetry of the 5577 intensity histograms can easily be explained by the Chapman theory on nocturnal emission of this radiation through triple shocks between oxygen atoms. *Subject Headings:* **1. Auroral spectra 2. Night sky luminescence 3. Spectral line 5577 (OI) Å 4. Haute-Provence Observatory, France.**—*A.V.* Ⓢ

11K–16 551.521.326:535.33:546.211

†Barth, Charles A. and Kaplan, Joseph, **The Herzberg oxygen bands in "air" afterglows and the night air glow.** California. Univ. at L. A. Institute of Geophysics, Contract AF 19(122)-453, Scientific Report, No. 5, May 1, **1956.** 26 p. 3 figs., table, 29 refs., 18 eqs. **DWB** (M21.4 C153s)—The ultraviolet $A\,^3\Sigma_u^+ - X\,^3\Sigma_g^-$ oxygen bands have been observed in emission from greenish-white "air" afterglows containing 95–98% nitrogen and 2–5% oxygen. The afterglows were excited by an electrodeless rf oscillator and examined with a grating spectrograph having an f/2 camera and a dispersion of 30 A/mm. The most probable mechanism of excitation of these bands in the afterglow is the two-body reaction $N + O_3 \rightarrow NO + O_2$ which releases 5.47 ev. A comparison of the afterglow spectrogram with an ultraviolet night airglow spectrogram shows that bands arising from higher vibrational levels are more intense in the airglow than in the afterglow. Collisional de-excitation can account for the lower vibrational temperature in the laboratory since the pressure is higher than in the upper atmosphere. The atomic nitrogen-ozone reaction also may occur in the chemosphere between 60 and 90 km and may contribute to the excitation of the night airglow Herzberg bands. The atomic nitrogen at this level could come from daylight predissociation of NO and N_2 and from the twilight dissociative recombination of ionized NO. (*Same item as* 8.10–156, *Met. Abstracts.*) *Subject Headings*: **1. Night airglow UV bands 2. Herzberg bands of O_2.**—*Authors' abstract.*

11K–17 551.521.326:535.33:537.52:546.17

Barth, Charles A., **Laboratory spectroscopic study in chemical aeronomy.** California. Univ. Institute of Geophysics, Contract AF 19(122)-453, Final Report, June 30, **1957.** 35 p. 16 figs. (incl. photos), 20 refs., 32 eqs. **DWB** (M21.4 C153s)—A report on laboratory studies and of equipment for spectroscopic investigations of the nitrogen, the oxygen and nitrogen-oxygen afterglows, with a discussion of N−O reactions in the upper atmosphere, the night airglow spectrum and reactions, and other recommended studies of these phenomena and of the chemical processes in the upper atmosphere. New nitric oxide β bands were discovered in a blue N−O afterglow, showing the dissociation energy of NO to be 6.50 ev and of N_2 to be 9.76 ev. New infrared bands of nitric oxide were also found in the blue afterglow and Herzberg oxygen bands in green air afterglow. (*Same item as* 10.6–203, *Met. Abstracts.*) *Subject Headings:* **1. Chemical aeronomy 2. Nitrogen-oxygen afterglows 3. Night airglow spectroscopy. I. Schade, William J.**—*M.R.*

11K–18 539.19:551.521.326:546.211

Barth, C. A. and Kaplan, J., **The ultraviolet spectrum of the oxygen afterglow and the night airglow.** *Journal of Molecular Spectroscopy*, N. Y., 3(6):583–587, Dec. **1959. DLC** (Unchecked)—The spectrum of the oxygen afterglow has been obtained between 3350 and 4500 A with sufficient resolution to resolve the rotational structure of the Herzberg oxygen bands. Six unknown spectral

features are present which cannot be identified with the postulated Broida-Gaydon oxygen bands. The vibrational intensity distribution of the Herzberg bands of the oxygen afterglow is compared with their distribution in the night airglow. Several of the unknown afterglow emissions appear to be able to be identified with unknown night airglow emission features. These unknown bands must come from some molecule other than oxygen. *Subject Headings:* **1. Night airglow spectrum 2. Oxygen afterglow 3. Ultraviolet spectra.**—*From Physics Abstracts, No. 5954, May 1960.*

11K–19 551.510.535:551.521.326

Bates, David R. and Massey, H. S. W., **A note on the ionic composition of the upper atmosphere.** (In: International conference on the Emission Spectra of the Night Sky and Aurorae, London, 1947, **Papers,** pub. **1948.** p. 48–50. 7 refs., 2 eqs.) **DWB**—An attempt to find a relation between light of night sky (100 km or higher) and ionospheric layers. CHAPMAN'S theory of layer formation is reviewed, concentration of negative ions (O^-) and its measurement discussed; diurnal variations accounted for. The contribution of O^- ions to night sky emission, as suggested by KASTLER (1946), and an alternative theory that source of continuum is two body radiative association between neutral atoms are both rejected if altitude of emitting layer is >500 km as reported by BARBIER (1947). (*Same item as* 6D–20, *Met. Abstracts.*) *Subject Headings:* **1. Night airglow 2. Ion concentration in stratosphere 3. Ionospheric layers.**—*M.R.*

11K–20 551.510.5

*†Bates, D. R. (*Queen's Univ. Belfast, Northern Ireland*), **Physics of the upper atmosphere.** (In: Kuiper, Gerard P. (*ed.*), **The earth as a planet.** Chicago. Univ. of Chicago Press, **1954.** p. 576–643. 15 tables, 157 eqs., bibliog. p. 636–643.) **DLC**—A complete review of the latest data on photochemistry of the upper atmosphere, considering the processes of dissociation and recombination of O_2, N_2 and their combinations, the minor constituents such as CO_2, CH_2, N_2O, and models of the upper atmosphere derived from such data as are available in this field. The ionosphere, airglow, aurorae and their relations to the constituents named above, the evidence for temperature above 100 km derived from ionosphere, aurora, escape of atmospheric gases and by direct measurement, and finally the heat balance, are considered in great detail. *Subject Headings:* **1. Upper atmosphere physics 2. Photochemistry of the upper atmosphere 3. Airglow 4. Auroral physics 5. Ionospheric physics.**—*M.R.*

11K–21 551.521.326:535.33

†Bates, D. R. and Moiseiwitsch, B. L., **Origin of the Meinel hydroxyl system in the night airglow.** *Journal of Atmospheric and Terrestrial Physics,* London, 8(6):305–308, June **1956.** table, 18 refs., 13 eqs. Also: Krasovskiĭ, V. I., **On the remarks of D. R. Bates and B. L. Moiseiwitsch (1956) regarding the O_3 and O_1* hypotheses of the excitation of the OH airglow.** *Ibid.,* 10(1):49–51, Jan. **1957.** 16 refs. Also: Bates, D. R. and Moiseiwitsch, B. L., **On the remarks of V. I. Krasovskiĭ regarding the O_3 and O_2 hypotheses of the OH airglow.** *Ibid.,* 11(1):68–70, **1957.** 14 refs., 2 eqs. **DWB**—In the first paper, the authors consider and reject arguments against the suggestion of BATES and NICOLET (1950) and HERZBERG (1951) that the Meinel hydroxyl system is due to $H+O_3 \rightarrow OH+O_2$, the hydroxyl molecule being vibrationally excited. (*Same item as* 7.11–190, *Met. Abstracts*). In the second paper, a discussion of BATES' and MOISEIWITSCH'S **Origin of the Meinel hydroxyl system in the night airglow is presented.** (*Same item as* 8.6–225, *Met. Abstracts.*) In the third paper BATES and MOISEIWITSCH state that KRASOVSKII'S claim that Meinel hydroxyl emission originates from 100 km level is unjustified. The excitation of 10th vibrational level of OH by $O_3+H \rightarrow O_2+OH$ depends mainly on photo-dissociation deep in the atmosphere. (*Same item as* 8.11–178, *Met. Abstracts.*) *Subject Headings:* **1. Night airglow spectrum.**—*C.E.P.B.*

11K–22 551.521.326

Bates, D. R. (*Queen's Univ. of Belfast*), **The airglow.** (In: Bates, D. R. (*ed.*), **The Earth and its atmosphere.** N. Y., Basic Books, **1957.** p. 223–230. fig.) **DLC**—The nightglow—its spectrum, seat of luminescence, theory of origin, twilight airglow and dayglow and artificially produced airglows are discussed for popular understanding. (*Same item as* 10.1–240, *Met. Abstracts*). *Subject Heading:* **1. Airglow.**—*M.R.*

11K–23 523.59 551.521.326

Blackwell, D. E.; Ingham, M. F. and Rundle, H. N., **Observations of twilight and night sky airglow near the equator.** *Annales de Géophysique,* Paris, 16(1):152–153, Jan./March **1960.** 9 refs. **DLC**—An expedition from the Cambridge Observatories made observations of the zodiacal light at the cosmic ray station of Chacaltaya in the Bolivian Andes (June/Aug. 1958). One of the purposes of the expedition was to photograph the spectrum of the zodiacal light. This note discusses the results of the measurements of the absolute intensities of these features. Some measurements of the absolute intensities in spectra of the night sky are also presented. *Subject Headings:* **1. Zodiacal**

light 2. Night sky spectrum 3. Cambridge Observatories expedition 4. Chacaltaya, Bolivia. —*A.V.*Ⓢ

11K–24 551.521.326:535.33:546.33

Blamont, Jacques-Émile (*Lab. Phys., École Normale Supérieure, Paris*), **Observations de l'émission atmosphérique des raies *D* du sodium au moyen d'un appareil à balayage magnétique.** [Observations of atmospheric emission of sodium ***D*** lines by means of an apparatus with a magnetic scanning device.] (In: **The airglow and the aurorae: à symposium.** London, Pergamon, **1956.** p. 99–113. 12 figs. [incl. photos], 4 tables, 9 refs., eqs. English summary p. 99.) **DWB**—An apparatus using the anomalous Zeeman effect in sodium vapor for the study of the twilight emission of the sodium D lines is described, and the results of observations presented and discussed. (*Same item as* 8.7–197, *Met. Abstracts.*) *Subject Heading:* **1. Sodium D line emission.**—*Author's abstract.*

11K–25 551.521.16:546.33:551.510.41

Bandt, J. C. and Chamberlain, J. W. (*both, Univ. of Chicago*), **Resonance scattering by atmospheric sodium, Pt. 5, Theory of the day airglow.** *Journal of Atmospheric and Terrestrial Physics*, London, 13(1/2):90–99, Dec. **1958.** 4 figs., table, 16 refs., 31 eqs. (For **Pts. 1–4,** *see* 8.2–149 and 8.2–150, Feb. 1957 and 10.2–219, Feb. 1959, *Met. Abstracts.*) **DLC**—Chandrasekhar's theory of radiative transfer is applied to the day airglow to obtain the D_2 and D_1 brightness as a function of the sodium abundance and ground albedo. An analytic method of integrating monochromatic intensities over a Doppler profile has been developed, eliminating the necessity for numerical quadratures. This method is general and could be used to simplify calculations in the twilight and night airglow sodium problems as well. A high ground albedo can nearly double the radiation incident on the sodium "layer," compared with direct sunlight alone. A general derivation is given of Hunten's (Pt. III) approximation for an effective optical thickness. In Appendix A the twilight problem is treated from the standpoint of the analytical method of line integrations and equations are given that may be used to extend the accuracy of the solutions; in Appendix B some X- and Y-functions for small optical thicknesses are tabulated: Appendix C gives basic formulas for extending the accuracy of analytical solutions to transfer problems in line radiation. (*Same item as* 10.8–238, *Met. Abstracts.*) *Subject Headings:* **1. Dayglow theories 2. Sodium in atmosphere 3. Radiative transfer 4. Resonance scattering.**—*Authors' abstract.*

11K–26 551.521.326:546.33:535.33

Chamberlain, J. W.; Hunten, D. M. and Mack, J. E. (*U. of Chicago; U. of Saskatchewan; U. of Wisc., resp.*), **Resonance scattering by atmospheric sodium, Pt. 4, Abundance of sodium in twilight.** *Journal of Atmospheric and Terrestrial Physics*, London, 12(2/3):153–165, **1958.** 5 figs., 3 tables, 18 refs., 11 eqs. **DLC**—The theory of Pt. I is extended to take account of the hyperfine structure of the *D*-lines. The absolute intensity of D_1+D_2 and the ratio D_2/D_1 are computed as functions of total Na abundance for an angle of solar depression, β, of 6.5°. Observations made in Saskatoon are discussed in terms of the seasonal variation of Na. Abundance determinations from the D_2/D_1 ratio in twilight and from the terrestrial component of *D*-line absorption in the solar spectrum are in good accord with abundances deduced from the absolute twilight intensity. (*Same item as* 10.2–219, *Met. Abstracts.*) *Subject Headings:* **1. Sodium *D* line 2. Sodium absorption 3. Twilight sodium spectrum.**—*Authors' abstract.*

11K–27 551.521.326:551.593.55:546.21:535.33

Chamberlain, J. W. (*Yerkes Obs., Univ. of Chicago*), **Extinction of the oxygen red lines in twilight** [*Summary only*]. *Journal of Atmospheric and Terrestrial Physics*, London, 15(1/2):95, Sept. **1959.** **DLC**—Various mechanisms for exciting the red lines at twilight are investigated. Computations are presented on the twilight enhancement to be expected from resonance scattering of sunlight at λ6300, which arises from the nebular transition of (OI). The problem differs from that for λ5893 of Na in two important respects. For (OI), secondary scatterings and self-absorption can be neglected and collisional deactivation must be included. The numerical calculations are based on an adopted distribution of O and O_2, with the latter constituent assumed to be the source of deactivation. The transmission function for the lower atmosphere is replaced with a simple screening height; this method of comparing theory and observations might be improved if the deactivation coefficient and model atmosphere were precisely known. Observations, when compared with the theory, suggest that very little of the (OI) twilight arises from resonance scattering. Similarly, dissociation of O_2 in the Schumann-Runge continuum contributes, but does not give by itself the observed absolute intensity or variation in intensity. While the above-mentioned mechanisms should contribute in the very early twilight, the main effect probably arises from the dissociative recombination of O_2^+. An elementary theory of the evening twilight variation is presented with this hypothesis and fair agreement with observations is obtained. The same mechanism probably explains the nightglow, with the height of emission in the neighborhood of 250–300 km. It is

speculated that erratic variations and the pre-dawn enhancement observed in winter may arise from diffusion (and other dynamic effects) of ions and O_2 in the lower part of the F region. *Subject Headings:* **1. Night airglow theories 2. Red emission lines 3. Twilight airglow.**—*Author's abstract.*Ⓢ

11K–28 551.521.326:551.510.535:541.12

†Chamberlain, J. W. (*Yerkes Obs., Univ. of Chicago*), **Recombination in the F2-layer and the oxygen red lines in the airglow.** *Journal of Atmospheric and Terrestrial Physics*, London, 15(1/2):96–98, Sept. **1959.** 23 refs. **DLC**—Present-day concepts of the upper atmosphere and recent observations suggest dissociative recombination for the F layers in the nightglow replacing the obsolete theories of resonance scattering, and that of dissociation of O_2 in the Schumann-Runge region. Deactivation of the red oxygen line, at low altitudes around 100 km where the green-line nightglow is excited, is suggested. *Subject Headings:* **1. Night airglow emission 2. Recombinations in F region 3. Red emission lines.**—*O.T.*Ⓢ

11K–29 551.506.22:551.594.5 551.521.326

Chapman, S., **Aurora and airglow.** Report from Subject group IV, of International Union of Geodesy and Geophysics, at the 10th Assembly, Rome **1954.** 7 p. refs. Mimeo.—Objectives of aurora and airglow program suggested for IGY, 1957–8 are set forth and visual, photographic, spectroscopic, radio-auroral, rocket auroral and airglow measurements planned, are described in some detail. (*Same item as* 9.7–38, *Met. Abstracts.*) *Subject Headings:* **1. Auroral investigations 2. Night airglow investigations 3. IGY program.**—*M.R.*

11K–30 551.506.22:551.594.5:551.521.326

Currie, B. W., **IGY aurora and airglow program.** *Ciencia*, Mexico City, 16(11/12):309–316, **1956.** 5 tables. **DWB**—Special problems and techniques to be used during IGY in the auroral and airglow program, a list of the 100 Western Hemisphere stations from pole to pole making or intended to make visual, photographic and photoelectric observations of auroras, a list of 23 stations to make patrol-type spectrographic observations, 12 stations to operate high resolution spectrographs and photoelectric scanning spectrometers during IGY, 13 stations to make auroral radar studies and 10 stations to make airglow observations, and a detailed account of the Canadian auroral program are included in this informative article. (*Same item as* 9.7–35, *Met. Abstracts.*) *Subject Headings:* **1. IGY auroral program 2. Auroral networks 3. Airglow networks 4. Canada 5. Western Hemisphere.**—*M.R.*

11K–31 535.33:551.521.326

†Dalgarno, A. (*Geophysics Research Directorate, ARDC, Bedford, Mass.*), **The altitudes and excitation mechanisms of the night airglow.** *Annales de Géophysique*, Paris, 14(3):241–252, July/Sept. **1958.** 99 refs., 24 eqs. **DLC**—A review is given of the present position regarding the altitudes and excitation mechanisms of night airglow. The author examines successively the oxygen green line, the oxygen red line, the Na D lines, the OH rotation-vibration bands, the molecular bands of O_2, the airglow continuum and other airglow emissions. It may be noted that if the proposed excitation mechanisms are correct, the diurnal and seasonal variations of the atmospheric system, the Herzberg system, the green line and possibly the airglow continuum should be very similar, which seems to be the case while none of the other emissions should be closely correlated with any of this group, as again seems to be the case though the data are as yet very limited. No close correlation of the red line with any emission would be expected, and those that have been reported with Na D are probably due to contamination of the red line by OH which frequently exhibits a striking correlation with Na D during the course of the night. This correlation is of particular interest since the mechanism of exciting the Na D line is still not established; it suggests that atomic hydrogen plays a significant role in the production of the Na D emission. (*Same item as* 10.7–213, *Met. Abstracts.*) *Subject Headings:* **1. Night airglow 2. Night airglow spectrum 3. Night airglow continuum.**—*A.V.*

11K–32 551.521.326:535.33

Delannoy, Jean and Weill, Gilbert, **Observation d'une nouvelle raie d'emission crépusculaire atmosphérique.** [Observation of a new atmospheric twilight emission line.] *Académie des Sciences, Paris, Comptes Rendus*, 247(11):806–807, Sept. 15, **1958.** DWB—Twilight spectra photographed in Adelie Land, Antarctica, in the course of the International Geophysical Year research programme, reveal a new emission line at 6708 ±1.5 A, tentatively identified as the resonance line of neutral Li at 6707.84 A. *Subject Headings:* **1. Twilight emission lines 2. Adelie Land, Antarctica.**—*Authors' abstract.*

11K–33 551.508.25 551.521.326:535.33

Dufay, Maurice, **Étude photoélectrique du spectre du ciel nocturne entre 0,7 et 1,1μ.** [Photoelectric study of the night sky spectrum between 0.7 and 1.1μ.] *Académie des Sciences, Paris, Comptes Rendus*, 244(3):364–367, Jan. 14, **1957.** fig., 4 refs. **DLC**—A Cs-O-Ag photoelectric cell mounted behind a monochromator was used for measuring the 0.7–1.1μ region of the night sky spectrum. The apparatus is described and a sample record is presented. The first 50 measurements made with this instrument are found to prove the feasibility of fast measurements which should become, after further improvement, comparable to those normally obtained by exposures of more than 20 hrs. The effective range of measurement is also considerably extended toward larger wavelengths. (*Same item as* 9.9–121, *Met. Abstracts.*) *Subject Headings:* **1. Night sky spectrum 2. Photoelectric monochromators.**—*G.T.*

11K–34 535.33:551.521.326

Dufay, Maurice, **Sur les intensités des bandes d'émission du ciel nocturne dans le proche infrarouge.** [Intensities of the emission bands of the night sky in the near infrared.] *Académie des Sciences, Paris, Comptes Rendus*, 246(15):2281–2283, April 14, **1958.** 2 figs., 6 refs. **DLC**—The recordings of the spectrum of nocturnal sky in the near infra-red by means of a monochromator with revolving grid followed by a photomultiplier made possible the study of intensity changes of the OH bands and of the O_2 "atmospheric" band (8640 Å). A rather clear correlation has been found between the intensity of this last band and the one of the 5577 Å ray of (O_1). (*Same item as* 10.1–241, *Met. Abstracts.*) *Subject Heading:* **1. Night sky spectrum.**—*A.V.*

11K–35 551.508.93:551.594.52:535.33

Dzhordzhio, N. V., **Nekotorye rezul'taty elektrofotometricheskikh izmereniĭ poliarnykh siianiĭ.** [Some results of electrophotometric measurements of auroras.] *Akademiia Nauk SSSR, Izvestiia Ser. Geofiz.*, No. 5:692–695, **1957.** 6 figs., table, 4 refs., eqs. **DLC**—With the aid of diagrams, the author describes the construction of a universal electrophotometer for studying the illumination of the night sky and the aurora. In addition, results of measurements with this instrument are presented. These include brightness of the night sky in two spectral regions at a fixed point of the sky with coordinates $h = 21°$ and $A = 0$ and distribution of the brightness of the night sky with height from the zenith to the horizon. Also equations for evaluating the errors of observation are presented. (*Same item as* 10.10–308, *Met. Abstracts.*) *Subject Headings:* **1. Auroral luminosity 2. Night sky brightness measurement techniques 3. Electrophotometry.**—*I.L.D.*

11K–36 546.33:551.521.326 551.557:551.510.535

Edwards, Howard D.; Bedinger, John F.; Manring, Edward R. (*all, Air Force Cambridge Res. Center, Bedford, Mass.*) and Cooper, C. D. (*Georgia Univ.*), **Emission from a sodium cloud artificially produced by means of a rocket.** (In: **The airglow and the aurorae: a symposium.** London, Pergamon, **1956.** p. 122–134. 10 figs. (incl. photo), 2 tables, 5 refs.) **DWB**—Following Bate's suggestion, 3 kg of metallic sodium vapor were ejected into the atmosphere from 50 to 113 km by means of two Aerobee rockets. The rockets were launched at the beginning of evening twilight on 21 Jan. and 12 Oct. 1955. Enhanced sodium emission at 5890 Å was definitely observed visually, photometrically and spectrographically from 85 km to 113 km during twilight. No sharp time discontinuities in intensity were observed when the region was enclosed by the earth's optical shadow. No increase in emission was observed during the night. Possible explanations are given for the lack of emission below 85 km. Spreading of the sodium cloud indicated winds at the 85-km level to be 180 mph from the northwest and 100 mph from the southeast at the 110 km level. (*Same item as* 8.7–198, *Met. Abstracts.*) *Subject Headings:* **1. Sodium emission 2. Ionospheric winds.**—*Authors' abstract.*

11K–37 535.33:551.594.5:551.521.326

Eropkin, D. I., **Interpretatsiia spektra poliarnogo siianiia i sveta nochnogo neba.** [Interpretation of the spectrum of aurorae and of the night sky light.] (In: Vsesoiuznaia Konferentsiia po Izucheniiu Stratosfery, Leningrad, **1934, Trudy,** pub. **1935.** p. 291 293. 2 figs., 3 tables, 4 eqs.) **DLC**—Numerous spectral lines observed during auroras or in the night airglow are tabulated and theory reviewed. The relation of intensity of lines in relation to height above the horizon for various wave lengths is shown graphically (after the author). Current conditions regarding atomic or molecular structure of auroral zone of the upper atmosphere and origin and nature of particles inducing the glow as obtained from auroral spectral intensity, etc. are summarized. (*Same item as* 5C–67, *Met. Abstracts*). *Subject Headings:* **1. Auroral spectra 2. Night airglow spectrum.**—*M.R.*

11K–38 551.521.326:535.34:546.11:546.211

Fedorova, N. I., **Infrakrasnyĭ spektr severnogo nochnogo neba v oblasti 9500–11500 A.** [Infrared spectrum of the northern night sky in the region 9500–11,500 A.] *Astronomicheskiĭ Zhurnal,*

Moscow, 34(2):247–249, **1957. DL** [(QB1.A47). 7 refs., 2 tables, 2 figs. Transl. into English in *Soviet Astronomy Aj*, New York, Vol. 1, **1957. DLC**—The relative intensities of hydroxyl bands recorded in Feb. 1955, near Murmansk, are reported. A spectrograph with an electron-optical converter having a dispersion of 230 A/mm was employed. The results are compared with the absolute intensities as calculated by ROACH for the near i.r. region (Manual for photometric observations of the Airglow during the IGY, Sept. 1956, meeting of CSAGI in Barcelona). They are not in agreement with ROACH's data, but agree well with those of LUKASHENIA and KRASOVSKIĬ. *Subject Headings:* **1. Night airglow spectra 2. Hydroxyl (OH) emissions.**—*From Phys. Abstracts, No. 6547, Sept. 1958.*

11K–39 551.521.326:535.33

†Fedorova, N. I., **Gidroksil'noe izluchenie verkhneĭ atmosfery.** [Hydroxyl radiation of the upper atmosphere.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofizich.*, No. 6:836–846, **1959.** 5 figs., 5 tables, 36 refs. Russian summary p. 836. **DLC**—The spectra of the night sky were obtained by means of the CP-50 spectrograph at the Biurakan Observatory ($\varphi = 40°21'$, $\lambda = 46°15'$) in 1956–1957. The results of analysis of measurements of relative and absolute intensities of the hydroxyl band in the near infrared region from 8200 to 11200 A are presented in tables and graphs and the rotational temperature of the OH band is computed on the basis of the formula

$$I_{em} = (\text{const}) i(J') e^{-F(J')/kT}.$$

Substantial differences are found with the intensities computed by ROACH. The density of different fluctuating levels was determined from the absolute intensities of OH bands. The density increases gradually with decrease of V^1. The rotational temperature was determined from the distribution of intensity in the P-branch; the rotational temperature apparently varied from night to night. The mean value was $233 \pm 16°$K. *Subject Headings:* **1. Hydroxyl (OH) emissions 2. Night airglow spectra.**—*Author's abstract and I.L.D.* Ⓢ

11K–40 551.521.326:535.33:546.33

Galperin, G. I. (*Geophysical Inst., Academy of Sciences, Moscow*), **The ratio of the intensities of the components of the sodium doublet in the twilight spectrum.** (In: **The airglow and the aurorae: a symposium.** London, Pergamon, **1956.** p. 91–94. fig., table, 11 refs., eqs.) **DWB**—The ratio of the intensities of the components of the sodium doublet was measured from photographs of twilight spectra obtained with a grating spectrograph which clearly resolved the two lines. The analysis of the measurements was carried out by two methods: (a) neglecting high-order scattering, and (b) by the use of the equation of transfer. The value obtained for the ratio is $1.30 \pm 20\%$. (*Same item as* 8.7–199, *Met. Abstracts.*) *Subject Headings:* **1. Night airglow spectrum 2. Sodium spectra.** —*Author's abstract.*

11K–41 551.510.53

†Gerson, N. C., **High atmosphere.** *American Geophysical Union, Geophysical Monograph*, No. 2:6–20, **1958.** 9 figs., 21 refs. **DLC**—In this detailed review the author discusses the following: atmospheric structure including the origin of weather patterns in the troposphere, solar energy absorption by the earth, and the thermal structure of the troposphere and stratosphere; atmospheric composition including gases, foreign particles introduced by meteoroids, cosmic dust, cosmic ray primaries or auroral primaries, the solar absorption spectrum in the atmosphere, photochemical reactions and distribution of minor photochemically produced or dissociated compounds in the atmosphere; atmospheric dynamics such as drift components at various altitudes, variation of wind speeds with altitude, high altitude wind speeds derived from auroral and airglow patterns across the sky; determination of drifts in the ionosphere and the possible interaction between winds at altitudes of 80 km or more and the lower atmosphere; origin and characteristics of auroras and airglow; frequency of auroras and their seasonal distribution; spectra of auroras and of airglow; the properties of the ionic layers of the ionosphere; the properties of the magnetic field; nature of whistlers, etc. *Subject Heading:* **1. Upper atmosphere physics.**—*I.L.D.*

11K–42 551.521.326 551.594.51:535.33

Ghosh, S. N., **Excitation processes of night sky and auroral spectra.** *International Council of Scientific Unions. Mixed Commission on Ionosphere, 2nd Meeting, Brussels, Sept. 1950, Proceedings.* p. 227–230. Pub. **1951. DWB**—Results of investigations lend strong support to the hypothesis that mutual neutralization of N_2^+ and O^- excites the observed N_2 bands and O lines of the night sky spectrum. The spectral features of the aurora that are common with night sky spectrum can be explained by the hypothesis. (*Same item as* 5C–148, *Met. Abstracts.*) *Subject Headings:* **1. Night airglow spectrum 2. Auroral spectra.**—*From author's conclusion.*

11K–43 551.501.7 551.510.53

Ghosh, S. N. (*Harvard Univ.*), **Methods for the measurement of upper atmospheric characteristics.** *Journal of Scientific and Industrial Research, Sec. A*, New Delhi, 14(6):277–284, June **1955.** 6 figs., 12 refs., 2 eqs. **DWB**—A review of technical methods, both direct and indirect, for sounding the upper atmosphere. Indirect methods include radio echoes for probing ionosphere, acoustical sounding, searchlight methods for determining density, meteor and auroral observations and spectroscopic studies of dissociation and recombination. Direct methods include airglow, rocket and balloon measurements and direct determination of temperature, winds and ionization in the ionosphere. Laboratory and theoretical studies of microwave propagation and photochemistry are also outlined and illustrated. (*Same item as* 7.7–83, *Met. Abstracts.*) *Subject Headings:* **1. Upper atmosphere sounding methods 2. Upper atmosphere physics 3. Ionospheric research.**—*M.R.*

11K–44 551.521.326:535.24

Granderye, L. M., **Cómo medir fotograficamente la luminosidad del cielo nocturno.** [How to measure photographically the light of the night sky.] *Urania*, Barcelona, 41(243):73–76, April/June **1956.** fig. **DWB, DLC**—Night airglow observations by photometry are briefly discussed and a device for measuring vertical, horizontal and intermediate luminosity with equal accuracy is described and illustrated. (*Same item as* 10.3–248, *Met. Abstracts.*) *Subject Heading:* **1. Night airglow photometry.**—*M.R.*

11K–45 523.77:551.521.326

Guilino, G. and Maier-Leibnitz, H. (*Max Planck Institut für Physik der Stratosphäre, Munich*), **Une nouvelle méthode pour l'étude de la lumière du ciel nocturne.** [A new method for the study of the night airglow.] *Journal de Physique et le Radium*, Paris, 19(3):270–272, March **1958.** 5 figs., 4 refs. French and English summaries p. 270. **DLC**—A monochromator is described that produces modulated light by interferences of a spectral line, whereas a continuous background is not modulated. No correction is needed for the background and the apparatus is capable of registering faint and extended light sources. (*Same item as* 10.1-242, *Met. Abstracts.*) *Subject Headings:* **1. Spectrometers 2. Night airglow 3. Munich, Germany.**—*Authors' abstract.*

11K–46 551.594.51 551.521.326

†Harrison, A. W. and Jones, A. Vallance (*both, Univ. of Saskatchewan*), **Measurements of the absolute intensity of the aurora and night airglow in the 0.9–2.0μ region.** *Journal of Atmospheric and Terrestrial Physics*, London, 11(3/4):192 199, **1957.** 6 figs., 2 tables, 20 refs., 2 eqs. **DLC**—Absolute intensity measurements have been made at Saskatoon of the bands of $\Delta v = 2$ and $\Delta v = 3$ sequences of the OH vibration-rotation bands of the night airglow. The relation intensities are in reasonable agreement with the calculations of Heaps and Herzberg (1952). The rate of production of OH molecules excited to the ninth vibrational level was estimated from the intensity of the 4,2 band to be 15×10^{11} molecules/cm^2 column sec. Spectra of the aurora in the 0.9μ–2.0μ region have been obtained with a spectrometer employing a PbS cell detector. The spectra show several new bands of the Meinel N_2^+ system and a strong emission at 1.04μ to which both the 0,0 1PG N_2 band and the $^2p - {}^2D$ NI doublet probably contribute. Absolute intensity measurements of the infrared auroral bands are in reasonable agreement with estimates based on extrapolations from bands at shorter wave lengths. (*Same item as* 9.9–315, *Met. Abstracts.*) *Subject Headings:* **1. Auroral intensity measurements 2. Night airglow intensity measurements.**—*Authors' abstract.*

11K–47 551.521.326:551.507.362.1:535.242

†Heppner, J. P. and Meredith, L. H. (*both, U. S. Naval Res. Lab., Wash., D. C.*), **Nightglow emission altitudes from rocket measurements.** *Journal of Geophysical Research*, Wash., D. C., 63(1):51–65, March **1958.** 8 figs., table, 25 refs. **DLC**—Four rocket-borne photometers measured nightglow emissions near λ6300, λ5893, λ5577, and λ5335. The emitting region of the oxygen green line, λ5577, was entirely between 90 and 118 km, and had a very sharp lower boundary. The sodium D lines were encountered primarily between 85 and 110 km, with a maximum intensity at 93 km. The upper boundary of D line emission was not definite, due to tailing off of the distribution and low total intensity, but D line emission extending into the 130- to 150-km region is indicated. The λ6300 photometer showed two distinct features: an emitting region from 56 to 100 km, and a large signal still present at the peak of flight, 163 km. We attribute the 56- to 100-km emission to the (9–3) Meinel OH band, and conclude that the region of oxygen red line emission must lie above 163 km. On the basis of relative band intensities for the Meinel OH bands and the dissimilarity of the signal-vs-altitude curves for the λ5335 and λ6300 photometers, we conclude that practically all atmospheric emission near λ5335 is due to an atmospheric "continuum," has a maximum intensity between 100 and 110 km, and is at least as bright as the stellar background. During descent of the rocket through the E region, the photometers recorded a bright glow in the rocket's wake. Energy for creating the glow had to come from atmospheric gases and not the rocket. Its spectra and other

features are discussed. (*Same item as* 9.11–203, *Met. Abstracts.*) *Subject Headings:* **1. Night airglow emission 2. Rocket-borne photometers 3. Night airglow spectra.**—*Authors' abstract.*

11K–48 551.521.326:551.513.7:551.557

Hikosaka, Tadayoshi; Saitô, Bunichi, and Yano, Kyô, **The general circulation of the atmosphere above 100 km and the latitude effect of the airglow.** *Japan. Science Council. Ionosphere Research Committee. Report of Ionosphere Research in Japan*, 12(4):472–474, **1958.** 2 figs., 5 refs. **DWB, DLC**—The green line of the airglow was found by ROACH more frequently brighter to the north than to the south of Cactus Peak (36°N) whereas at Haute Provence (44°N) he noticed an opposite tendency and concluded that there must be a region of maximum excitation between these two latitudes. This is supported by the authors who assume that the maximum intensity of the middle latitudes might be due to some form of the circulation of the atmosphere which transports the dissociated atoms of upper layers to lower, denser layers where they recombine easily. They conclude that the general circulation of the atmosphere above 90 or 100 km is the most important factor, though not the sole reason, of the latitude effect and the seasonal variation of the airglow. *Subject Headings:* **1. Latitude effects on night airglow 2. Upper air circulation.**—*E.K.*

11K–49 551.521.326:551.593.51(534)

Hirst, N. F., **Observation of optical phenomena at Sirah Island, Aden, Oct. 7, 1957.** *Meteorological Magazine*, London, 87(1035):278, Sept. **1958. DWB, DLC**—A very pale green glow was observed in the southern sky over the Indian Ocean at 1915 hours on Oct. 7, 1957 at Sirah Island, Aden. The glow was marked by a very faint ill-defined boundary about 25 degrees above the southern horizon lowering to about 20 degrees on the southwestern horizon. The phenomenon lasted to 2130 hours, when it faded completely. About 2125 hours a russet-colored band of light was observed low down on the southern horizon just before the glow faded. It is suggested that this phenomenon may have been an airglow or moonlight reflected from dust layers. *Subject Headings:* **1. Airglow 2. Optical phenomena 3. Sirah Island, Aden.**—*I.L.D.*

11K–50 551.501:551.521.326 551.593.653

Hoffmeister, C. and Paton, J., **Visual observations of the airglow and other non-auroral luminosities of the night sky.** *International Geophysical Year, 1957/1958, Annals*, Vol. 4:110–114, **1957. DWB**—Characteristic properties and forms of appearance of non-auroral luminous phenomena (airglow, zodiacal light, noctilucent clouds and mother-of-pearl clouds) are described for the benefit of observers who will be called upon to report visual observations of these phenomena. *Subject Headings:* **1. Visual observations of night sky luminescence 2. Noctilucent cloud observation instructions.**—*G.T.*

11K–51 551.521.326:523.16

Hoffmeister, C., **Interplanetare Materie und verstärktes nachthimmelsleuchten.** [Interplanetary matter and increased nightglow.] *Zeitschrift für Astrophysik*, Berlin, 49(4):233–242, **1960.** 6 graphs, table, refs., eqs. **DLC**—Thirty years' statistics of the increased airglow show that its maxima exhibit a strong tendency to recur annually throughout the whole period of observation. A relation to meteoric currents is indicated with a high degree of probability. The interaction of gravitation and radiation pressure leads to a preference of short period currents, especially those with semi-major axes <5 astronomical units. There is some indication of a relation to solar activity, the airglow maxima coinciding with sunspot minima. This phenomenon, as well as a very distinct decrease of airglow activity after 1947, can also be explained by changes of radiation pressure. *Subject Headings:* **1. Annual night airglow variations 2. Meteor-night airglow relationships 3. Sunspot-night airglow relationships.**—*Author's abstract.* Ⓢ

11K–52 551.521.6:546.33

Hunten, D. M. (*Univ. of Saskatchewan, Saskatoon*), **Seasonal variations of twilight sodium emission.** (In: **The airglow and the aurorae: a symposium.** London, Pergamon, **1956.** p. 114–121. 2 figs., table, 19 refs., eqs.) **DWB**—Measurements of maximum intensity and height of maximum density over a two-year period are reported. The angular surface brightness varies between 5 and 44×10^7 quanta/cm^2 sec sterad; the average variation is between 6.5 and 34, with minimum at the end of June and maximum at the end of Feb. The number of atoms/cm^2 column may be found by multiplying these by 10. The height varies not more than 1 or 2 km about the mean value 84.5 ± 5 km. The only mechanism for the intensity variation not eliminated by other evidence is the change in atom-ion equilibrium with the length of the day. This must be coupled with considerable transport of neutral sodium from the polar regions in winter to explain the large amplitude of variation, but still encounters the difficulty that high intensities are observed for some time after the end of the polar night. (*Same item as* 8.7–201, *Met. Abstracts.*) *Subject Heading:* **1. Sodium emission variations.**—*Author's abstract.*

11K–53 523.77:551.594.5:551.521.326:535.3

Hunten, D. M. (*Univ. of Saskatchewan, Saskatoon*). **Recent work at the University of Saskatchewan on auroral and night sky spectra.** *Annales de Géophysique*, Paris, 14(2):167–173, April–June 1958. fig., 19 refs. French and English summaries p. 167. **DLC**—Some of the work of the past three years in spectroscopy of aurora and airglow at Saskatoon and also at Churchill is reviewed. Measurements of rotational temperature of the N_2^+ band at 3914 Å are consistent with the expected gradient of 0° km; this is true at Churchill as well. Spectral features observed include several bands of the N_2^+ Meinel system: (0,0) at 11,100 Å and (0,1) and (1,2) near 15,000 Å. The (1,0) and (1,2) bands often have anomalously high intensity; it may be that they are excited preferentially by collision with O^+ (^2D). Hydrogen lines appear further south in the stronger auroral displays but other predictions of the Martyn theory are not confirmed. OH bands in the airglow have been observed out to 20,000 Å; the intensity of the (4,2) band has been measured as 175 kilorayleighs and the rotational temperature as 200°K. (*Same item as* 10,2–340, *Met. Abstracts.*) *Subject Headings:* **1. Auroral spectroscopy 2. Airglow spectroscopy 3. Rotational temperature measurements 4. Saskatoon, Canada.**—*Author's abstract.*

11K–54 551.594.55:564.3

Hunten, D. M. (*Univ. Saskatchewan, Saskatoon*). **Resonance scattering by atmospheric sodium Pt. 8, An improved method of deducing the vertical distribution.** *Journal of Atmospheric and Terrestrial Physics*, N. Y., p. 295–301. Feb. **1960.** 2 figs., table, 8 refs., 3 eqs. **DLC**—It is shown that the derivative of sodium twilight brightness with shadow height may be regarded as a smeared version of the vertical distribution of sodium atoms. The distribution may be recovered by use of the chord construction of BRACEWELL. The method is tested on a model distribution and found satisfactory; it is easier to use and gives more detail than the matrix method previously proposed. When the sodium abundance is large, the derivative curve must be corrected for resonance absorption before it can be used. A simple method of doing this is described and the required numbers tabulated. *Subject Headings:* **1. Twilight sodium spectrum 2. Vertical sodium distribution.**—*Author's abstract.* Ⓢ

11K–55 551.521.326:551.594.5

Hunten, D. M. and Jones, A. Vallance. **Basic research on aurora and airglow.** Saskatchewan Univ. Dept. of Physics, Contract AF 19(604)-1831, Final Report FRB, April 30, **1960.** 52 p. 4 figs. **DWB**—The work carried out during the term of the Contract is described and discussed. Abstracts or summaries of all the publications and reports are given. A brief discussion is given on the instruments in use in the work with special emphasis on instrumentation constructed during the course of the Contract. Modifications made to the two photographic spectrographs are described and a brief description is given of the high speed petrol spectrograph constructed at the University. Other instruments described are the infrared spectrometers, the balloon infrared spectrometer, the Michelson interferometer and the infrared calibration equipment. Two photometers for the study of sodium and other emissions in the twilight airglow are discussed. Two types of memory unit for use with spectrometers are briefly described. A short account is given of the coating equipment for the preparation of interference filters. An account is given of the status of investigations on the twilight emissions in the airglow of sodium, lithium, ionized calcium, potassium and molecular oxygen. Results in the spectroscopy of aurora include important work in the obtaining of high dispersion spectra of sunlit auroral rays and of type-A red aurora. Advances have been made in the study of the infrared spectrum of aurora beyond 0.9μ by the use of photomultiplier and photoconductive detectors in scanning spectrometers. Observations of the Meinel bands as far as 2.1μ have been made. Preliminary results are given of a new and important technique for obtaining spectra in the visible region using a scanning spectrometer and a memory system. Observations of the behaviour of the hydrogen emissions in the development of aurora as seen from Saskatoon are discussed. New information has been obtained on the night airglow spectra between 1.0 and 4.0μ. Improvements in instrumentation have made it possible to obtain infrared spectra with spectral slit widths as low as 25 A. The construction of a balloon-borne spectrometer is described. Determinations of temperature from auroral spectra and from night airglow spectra have been made. Temperatures of over 2000°K were obtained from sunlit auroral rays and up to 1000°K from type-A red aurora. Temperatures derived from the OH night airglow bands varied from 200° to 150°K. General conclusions and the proposed direction for further work are indicated. *Subject Headings:* **1. Airglow investigations 2. Auroral research.**—*Authors' abstract.* Ⓢ

11K–56 551.521.326:551.508.92(99)

Huruhata, Masaaki and Nakamura, Junji (*both, Tokyo Astron. Obs.*). **Airglow observations on board the "Soya," Japanese expedition to Antarctic.** *Japan. Science Council. Ionosphere Research Committee. Report of Ionosphere Research in Japan*, 11(2):35–40, June **1957.** 3 figs., table, 2 refs. **DWB.** Also in: *Annales de Geophysique*, Paris, 14(2):175–178, April–June, **1958.** 2 figs., 2 refs. French and English summaries p. 175. **DLC.** Also: Nakamura, Junji, **Airglow observation**

on M/S "Soya." *Antarctic Record*, Tokyo, No. 3:25–31, March **1958.** 3 figs., photo, table, 3 refs. In Japanese; English summary p. 25. **DWB**—On board the "Soya," expedition ship to the Antarctic, airglow observations were made from November 1956 to April 1957, during her voyages from Tokyo to Cape Town and return. The zenith intensities of λ5577 line were compared with the fluorescent surface of radium paint and were calibrated with the photometer of the Tokyo Astronomical Observatory. The photometer is exactly the same as those used in the Japanese Islands for the IGY, except for its mounting. The objective lens has an aperture of 4.6 cm and a focal length of 13.0 cm. An opening of 7.0 mm at the focus of the lens leads the light into the photomultiplier tube, RCA 1P21. In front of the opening, two interference filters, one with its peak transmission of 5577 A and the other at 5300 A, can be alternately set by a small electric magnet. The 5300 A filter is used as a control. Adding a neutral filter to this, the photocurrent through this filter is equalized with that through the 5577 A filter for GO stars. The exchange of these two filters is automatically made by an electric contact once in twenty-five seconds. The photometer is set on a gimbal mounting as in Fig. 1, so as to be always directed to zenith in spite of the pitching and rolling of the ice-breaker. The mean value of absolute intensity in Rayleigh was obtained as 238 for the deflection of the standard light. The absolute calibration of the intensity on each night was made by comparison with standard light, using the above value of intensity. The results show that the latitude dependence of intensity seems to be real, having the minimum intensity around the equator. The tendency at the middle latitude is still ambiguous. (*Same item as* 9.11–204, *Met. Abstracts.*) *Subject Headings:* **1. Airglow investigations 2. Night airglow photometers 3. Antarctic airglow observation 4. Antarctica.**—*Authors' abstract.*

11K–57 551.521.326:535.24

Huruhata, Masaaki and Tohmatsu, Takao, **The transfer problem of nightglow and its applications to photoelectric photometry.** *Japan. Science Council. Ionosphere Research Committee, Report of Ionosphere Research in Japan*, 11(1):11–16, **1957.** 2 figs., table, 8 refs., 3+eqs. **DWB.** Also reprinted as: *Tokyo. Univ. Geophysical Institute, Geophysical Notes*, 10(1), **1957.** Contribution No. 8. **DLC**—Transfer problems of nightglow in the atmosphere are discussed. A theoretical treatment of scattered light applicable for an arbitrary height of the emitting layer, atmospheric conditions (ozone amount, scattering of the air molecule and absorbing matters near the ground), albedo of the ground and height of the observing station is tried. The results in the plane-parallel atmosphere are extended to the case of spherical atmosphere. The numerical results are applied to the determination of the height of the [O_I] λ5577 emitting layer. From the mean intensity in autumn and winter of 1953 to 1955 in Japan, it is found that the height of the layer will not exceed 150 km, and probably be 100 km in average. The theories are also applied to the criticism of the "two-color method" in photoelectric photometry. The usual and conventional method of the subtraction of background intensity is authorized for ordinary observational conditions. (*Same item as* 9.9–183, *Met. Abstracts.*) *Subject Headings:* **1. Emission layer heights 2. Spectral line 5577 A [O_I] 3. Night airglow spectrum 4. Photoelectric photometry.**—*Authors' abstract.*

11K–58 551.521.326:551.594.5(52)

Huruhata, Masaaki (*Tokyo Astronomical Obs.*), **Aurora and airglow observations on Feb. 11, 1958.** *Japan. Science Council. Ionosphere Research Committee, Report of Ionosphere Research in Japan*, 12(1):40–41, **1958.** table. **DWB, DLC**—A short descriptive note reporting the observations made of aurora and airglow at different times in the northern half of Japan. The estimated intensity at the time of maximum brightness and other particulars of aurora are given. Details of aurora observations made at Memambetsu Observatory are presented. These observations were made from an all-sky camera, a petrol spectrograph and a scanning photoelectric photometer. A rough estimation of the aurora spectrum is tabulated. The intensities of the λ5577 Å emission as observed at 3 airglow stations are also tabulated. *Subject Headings:* **1. Night airglow emission 2. Auroral observations 3. Spectral line 5577 Å 4. Japan.**—*I.S.*

11K–59 551.506.22:016

†International Geophysical Year, 1957/1958, Special Committee, **Draft of IGY bibliography (first issue).** Uccle, Belgium, CSAGI Secretariat General, **1958.** 150 p. Prepared from various sources of the CSAGI Secretariat General, from scientific journals, and from *Bulletin Signalétique, Meteorological Abstracts and Bibliography*, etc. 19 subject groups, subarranged chronologically. Titles and journals cited generally in either English or French. List of journals cited, and abbreviations used, p. 143–150. "Additions to bibliography to be released periodically." These are some of the subjects dealt with: (a) Meteorology (b) Geomagnetism (c) Aurora and Airglow (d) Ionosphere (e) Solar activity (f) Cosmic rays (g) Glaciology (h) Seismology. *Subject Headings:* **1. IGY bibliographies 2. Airglow bibliographies.**—*A.H.K.*

11K–60 551.521.326:551.594.5:551.506.22

O mezhdunarodnoĭ programme issledovaniĭ poliarnykh siianiĭ i svecheniia nochnogo neba. [International research program on auroras and night sky glow.] *Akademiia Nauk SSSR. Mezhduvedomstvennyĭ Komitet po Provedeniiu Mezhdunarodnogo Geofizicheskogo Goda, Informatsionnyĭ Biulleten'*, No. 3:10–18, **1957. DLC**—Excerpts from the resolution of the Rome conference and S. CHAPMAN'S report at the Barcelona conference of the Special Committee on the IGY, outlining the international research program on auroras and night sky glow. Auroral investigation was to include: 1) Division of the globe into 5 auroral regions; 2) Basic methods of investigation—(a) visual observation (organization, observation methods, equipment), (b) photographic observations, (c) photometric studies, (d) spectrographic investigations; 3) Radar observations; 4) Investigations of radio wave absorption; 5) Equipment for vertical sounding of the ionosphere; 6) Investigation by means of rockets; 7) Geomagnetic investigations; 8) Phenomena of atmospheric electricity connected with auroras; 9) Sound phenomena during auroras. A less elaborate program for night airglow research was outlined. (*Same item as* 11.1–39, *Met. Abstracts.*) *Subject Headings:* **1. IGY airglow program 2. IGY aurora program.**—*A.M.P.*

11K–61 551.521.17:551.521.326

James, J. F. (*Dept. of Physics, Univ. of Reading, Berks*), **Laboratory experiments on the day airglow.** (In: **The airglow and the aurorae: a symposium.** London, Pergamon, **1956.** p. 273–275. fig., 3 refs.) **DWB**—The passage of a beam of ultraviolet radiation through oxygen and nitrogen renders the path of the beam luminous. Experiments indicate that the effect is due to fluorescence of the gases. The nature of the resulting visible radiation is discussed, and an estimate made of the efficiency of the process. (*Same item as* 8.7–203, *Met. Abstracts.*) *Subject Headings:* **1. Ultraviolet radiation effects 2. Airglow investigations.**—*Author's abstract.*

11K–62 535.33:551.521.326:546.34

Jones, A. Vallance, **Observations of the lithium lines in the twilight airglow in the Northern Hemisphere.** *Nature*, London, 183(4671):1315–1316, May 9, **1959.** 10 refs. **DLC**—Several explanations of the orgin of lithium atoms in the upper atmosphere and the presence of lithium resonance in the twilight airglow are discussed. The most probable origin is meteoric material and "hydrogen" bomb tests. Case studies of twilight spectra over Saskatoon indicate an abundance of lithium estimated at 9×10^6 atoms/sq cm, while sodium abundance is as high as 20×10^9 atoms/sq cm, the lithium-sodium abundance ratio is approximately 45×10^{-5} over the same area. The latter ratio compares with 200×10^{-5} estimated for meteors and 2.3×10^{-5} for sea water. *Subject Headings:* **1. Lithium in upper atmosphere 2. Twilight spectra 3. Saskatoon, Canada.**—*N.N.* Ⓢ

11K–63 551.510.534:551.521.326:546.214

Kaplan, Joseph, **Laboratory studies related to the physics of the upper atmosphere.** *I.U.G.G. Association of Terrestrial Magnetism and Electricity, Brussels, 1951, Transactions*, pub. **1954.** p. 249–253. eqs. **DWB**—A note summarizing the recent work related to the physics of the upper atmosphere. These studies emphasize the importance of ozone in the basic mechanisms and give indications that night airglow spectra can be duplicated in the laboratory. They also indicate that some important modifications may have to be introduced into our descriptions of ozone production and distributions in the atmosphere. The changes brought out by recent work into the after-glow picture are described. (*Same item as* 5C-150, March 1954, *Met. Abstracts.*) *Subject Headings:* **1. Upper atmosphere physics 2. Night airglow spectra 3. Ozone distribution.**—*I.S.*

11K–64 551.510.535:551.521.326

Khvostikov, I. A., **Sopostavleniia svoĭstv svecheniia nochnogo neba i ionosfery.** [A comparison between the properties of luminosity of the night sky and the ionosphere.] *Priroda*, 32(3): 59–60, March **1943.** 2 figs. **DLC**—Results of such comparison made by B. HECHTEL in 1939–1940 during his observations are presented and discussed. These results showed only a slight dependence, the correlation coefficient averaged 0.3. However, the author indicates that these results are not conclusive that there is no real connection between these phenomena. Reflections of radio waves indicate the properties of the ionosphere only at the very point of reflection; reflections at different altitudes proceed differently (those of F layer are quite different from those of E layer). Night sky luminosity, on the other hand, originates in great depths and its brightness gives an average picture of the processes occurring simultaneously at different heights. (*Same item as* 6D–17, *Met. Abstracts.*) *Subject Headings:* **1. Ionospheric reflection 2. Night airglow.**—*A.M.P.*

11K–65 551.521.326:551.507.362.1

Koomen, M. J.; Scolnik, R. and Tousey, R. (*all, U. S. Naval Res. Lab., Wash., D. C.*), **Direct measurements of the night airglow.** (In: **The threshold of space,** ed. by M. Zelikoff. N. Y., Pergamon Press, **1957.** p. 217–224. 9 figs., 7 refs.) **DLC**—Recent measurements of the night

airglow during two rocket experiments are reported to measure the height of the emission layers. The photometer arrangement and samples of the telemeter records are shown. Intensity-height readings are given for λ5577 Å as well as the azimuth distribution by rocket and ground-based photometers. Other data govern the intensity of λ5522 Å and λ5893 Å. *Subject Headings:* **1. Night airglow 2. Rocket soundings.**—*A.A.*

11K–66 551.521.326:535.24:546.17

Kosibowa, Stefania (*Wroclaw Astronomical Obs.*), **On the use of the λ5200 and λ5300 filters as control filters in airglow observations.** *Acta Geophysica Polonica*, Warsaw, 7(2):134–135, **1959.** Polish version p. 135. **DWB, DLC**—In the photoelectric mode of airglow observation, control filters in the λ5200 or λ5300 wave lengths are used to isolate the emission itself by reducing the unwanted background light. In periods of increased solar and auroral activity, however, the influence of the nitrogen atom line λ5199 may falsify the observational results as the line lies within the range of both filters. *Subject Headings:* **1. Night airglow photometry 2. Nitrogen lines.**—*I.R.* Ⓢ

11K–67 551.521.326:535.33

Krasovskiĭ, V. I., **Novye izlucheniia nochnogo neba na uchastke 8000–11,000 Å.** [New radiation of the night sky in a zone of 8000–11,000 Å.] *Akademiia Nauk SSSR. Krymskaia Astrofizicheskaia Observatoriia, Izvestiia*, 5:100 104, **1950.** 3 figs., 5 refs. **DLC**—A three-prism spectrograph with linear dispersion of about 1200–2400 Å on 1 mm was constructed for observations during 1950. These observations led to the discovery of six new lines of emission with wave length of 8870, 9391, 9976, 10,217, 10,374 and 10,827 Å. It was found that heavy emissions of night sky are present for many sections inside this range. (*Same item as* 5.1–162, *Met. Abstracts.*) *Subject Heading:* **1. Night sky spectra.**—*N. T. Zikeev.*

11K–68 551.521.326

Krasovskiĭ, V. I., **Priroda izmeneniĭ intensivnosti emissiĭ zemnoĭ atmosfery.** [The nature of variations in the intensity of emission of the earth's atmosphere.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 5:664–669, May **1957.** 10 refs., 19 eqs. **DLC**—In this analysis of the possible original causes of variations in the intensity of emissions of the night sky the author discusses the following: variation or exhaustion of initial products in the zone of reaction such as OH and the roles of temperature, pressure, subsonic waves from the troposphere and solar radiation and mixing of the earth's atmosphere. (*Same item as* 10.8–242, *Met. Abstracts.*) *Subject Heading:* **1. Night sky emission theories.**—*Author's abstract* (*I.L.D.*).

11K–69 551.521.326

†Krasovskiĭ, V. I., **Proiskhozhdenie gidrosil'noĭ sistemy v izluchenii nochnogo neba.** [Origin of the hydroxyl system in the light of the night sky.] *Uspekhi Fizicheskikh Nauk*, Moscow, 63(4): 673–691, Dec. **1957.** tables, 39 refs., 30 eqs. **DWB, DLC**—The author reviews the present state of knowledge of the radiation of the night sky, in particular the hydroxyl radiation. The discussion includes the following: the nature of the hydroxyl emission as presented on the basis of the O_3 hypothesis and the O_2 hypothesis; atomic hydrogen in the upper atmosphere, the role of hydroxyl in the emissions of the night sky, the atomic oxygen (OI) 5577 Å emission, the atomic oxygen (OI) 6300 Å emission, the NaI emission, the continuum, and the O_2 emission. (*Same item as* 10.10–251, *Met. Abstracts.*) *Subject Headings:* **1. Hydroxyl (OH) emissions 2. Night sky spectrum.**—*I.L.D.*

11K–70 523.77:551.521.326:551.594.5

†Krasovskiĭ, V. I. (*Inst. for Atmospheric Physics, Acad. of Sciences of the U.S.S.R., Moscow*), **The nature of emissions of the upper atmosphere.** *Annales de Géophysique*, Paris, 14(4):395–413, Oct./Dec. **1958.** 3 tables, 27 refs. **DLC**—Remarks related to the theory of the emissions of the night airglow, twilight flash and auroras. The author successively examines: hydroxyl bands, atomic hydrogen of the upper atmosphere, the [OI] 5577 Å emission, the [OI] 6300 Å emissions, the emission of NaI, the continuum, emission of O_2 and the auroral spectrum. The independence of the upper atmosphere emissions of solar activity in low and middle latitudes leads to a conclusion that solar ultraviolet radiation, responsible for these emissions, unlike the ionizing radiations, varies little, if at all, with solar activity. Owing to this circumstance, while searching for the true mechanisms responsible for the sky airglow, the author discards the excitation mechanisms connected to some other extent with ionization of the upper atmosphere. He did not find any processes which may be supposed to compensate for the action of the ionizing radiation variations during a cycle of solar activity. (*Same item as* 10.9–215, *Met. Abstracts.*) *Subject Headings:* **1. Upper atmosphere emission 2. Night airglow 3. Twilight flash 4. Auroras.**—*A.V.*

11K–71 551.507.362.1:551.521.326

†Kupperian, James E., Jr. and Kreplin, Robert W. (*both, U. S. Naval Res. Lab., Wash., D. C.*), **Optical aspect system for rockets.** *Review of Scientific Instruments*, N. Y., 28(1):14–19, Jan. **1957.**

8 figs., 20 refs., 6 eqs. **DLC, DGL**—A system for determining the orientation of a rocket as a function of time and altitude from photographic records recovered after impact is described in detail. In addition to sun, moon, planets, stars or earth features, the albedo of the earth or the night airglow may be used to determine aspect of orientation of the rocket at a given instant. Reduction of data by a special mechanical computer has been worked out, and the system and a solution of the aspect problem as worked out is described and illustrated. The accuracy of the system is also discussed. On a typical flight test, cloud albedo checks gave an accuracy of $\pm 3°$, and night sky objects the same 3° accuracy. (*Same item as* 9.9–117, *Met. Abstracts.*) *Subject Headings:* **1. Rocket aspect determinations 2. Night airglow.**—*M.R.*

11K–72 551.521.17:551.521.326

Kupperian, J. E., Jr.; Byram, E.; Chubb, T. A. and Friedman, H., **Extreme ultraviolet radiation in the night sky.** *Annales de Géophysique*, Paris, 14(3):329–333, July/Sept., **1958.** 2 figs., table, 3 refs. Also: similar title in *Planetary and Space Science*, N. Y., London, 1(1):3–6, Jan. **1959.** fig., 5 refs. **DLC.** Also in: *International Geophysical Year, 1957/1958. IGY World Data Center A. IGY Rocket Report Series*, No. 1:186–189, July 30, **1958.** fig., table, 3 refs. **DWB** (Mo7.362 H237ex)—A directional survey of night sky ultraviolet radiation was made from an Aerobee rocket (NRL-31, 2200, March 28, 1957) using collimated photon counters and ion chambers sensitive in the 1040 Å to 1350 Å spectral region. Discrete sources of radiation were observed in the 1225 to 1350 Å region which in most cases could be identified with known celestial objects. In contrast a diffuse and quite intense radiation was observed in the 1040 to 1225 Å region. This radiation has been identified by its atmospheric absorption as the Lyman α line of hydrogen. The spatial distribution of this radiation as mapped by the spinning and yawing rocket was obtained for about 50% of both the upper and lower hemispheres. Two features of this distribution are of prime interest. The radiation from above showed a pronounced minimum which was symmetrical about the antisolar direction. Radiation was also observed from the field of view below the rocket. This radiation when viewed from above 120 km was uniformly distributed and was about 42% of the average intensity from above. The results are interpreted as evidence for atomic hydrogen both in the solar system external to the earth's orbit and in the D and E regions of the atmosphere. (*Same item as* 10.10 252, *Met. Abstracts.*) *Subject Headings:* **1. Ultraviolet night sky radiation 2. Lyman alpha radiation 3. Atmospheric scattering.**—*Authors' abstract.*

11K–73 551.521.326:535.33:551.593.55

Kvifte, G. (*Dept. Physics, Agric. Coll., Norway*), **The twilight radiation at 6708 A.** *Nature*, London, 183(4672):1384–1385, May 16, **1959.** fig., 9 refs. **DWB**—Control observations at Ås, Norway (59°40′N, 10°47′E), particularly those related to photometer tracking, are presented and they confirm the new atomic line $\lambda 6708 \pm 1.5$ A as first observed at Adélie Land. The Norwegian observations yielded 6707.7 ± 0.5 A. The author suggests that lithium and sodium may originate at the same atmospheric level, and that more than a single source is accountable for atmospheric metal content. Whether or not the potassium can be positively determined by further observations of the distinct increases of the background radiation is of interest. *Subject Heading:* **1. Twilight radiation.**—*W.N.* Ⓢ

11K 74 551.521.326 551.594.5

Kvifte, G. (*Dept. of Physics, Agric. Coll., Norway*), **Auroral and nightglow observations at Ås, Norway.** *Journal of Atmospheric and Terrestrial Physics*, N. Y., 16(3/4):252–258, Nov. **1959.** fig., 2 tables, 16 refs. **DWB, DLC**—A new grating spectrograph has been used in the study of the upper atmosphere. A summary is given of the results of auroral observations. In a more detailed account of nightglow investigations are given precise wavelengths of the band lines of the 5.0, 6.1, 8.2 and 9.6 bands of the Meinel OH system, and absolute intensities of the bands. From the intensity distribution of the lines within the 6.1 and 9.3 bands is derived a rotational temperature of the emitting layer of 215°K. A sharp Hα line and the red forbidden lines of N*II* are found to be present in the nightglow. *Subject Headings:* **1. Night airglow data 2. Auroral observations 3. Spectrograph 4. Ås, Norway.**—*Author's abstract.*

11K–75 551.594.5 551.521.32

Lange-Hesse, G., **Das Internationale Geophysikalische Jahr, XII: Polarlicht und Nachthimmelsleuchten.** [The IGY, Pt. 12, Aurora and night sky light.] *Umschau*, 57(23):707–709, 1 Dec. **1957** 4 figs., foot-refs. **DLC**—There is a permanent weak light source round the earth, and a much stronger occasional ring of light 22–24° from the magnetic pole. This is the aurora. The cause of the night sky light is the ionization and dissociation of gases by UV sunlight at great heights, that of aurora corpuscular rays from the sun focused by the geomagnetic field. The IGY program for world-wide study of aurora is set out, including tropics and radio waves, and especially German contribution

to observation of aurora and night sky light. (*Same item as* 9.4–276, *Met. Abstracts.*) *Subject Headings:* **1. Auroras 2. Night airglow.**—*C.E.P.B.*

11K–76 535.33:551.521.326:551.593.55

Link, František (*Astronomical Inst., Czech Technical Univ., Prague*), **Emissions de la haute atmosphere pendant le crepuscule, Pt. 1, Methode de recherches.** [Twilight emission of the upper atmosphere. Pt. 1, Research method.] *Studia Geophysica et Geodaetica*, Prague, 2(4):345–352, **1958.** 3 figs., table, 2 refs., 20 eqs. Russian summary p. 352. **DWB**—In the luminescence of the twilight sky at the zenith measured in a spectral region, it is necessary to distinguish the following, viz: (1) the molecular diffusion of sunlight along the vertical of observation, (2) the interplanetary and interstellar origin of light, and (3) the luminescence of the upper layers of the atmosphere. The theoretical basis of making photoelectric measurements and of separating the complex luminescence from other components in order to determine its variations during twilight and to distinguish one twilight from another is presented, also numerical examples are given. A formula for computing the emission of the atmosphere is derived, namely

$$I_0(U)\,\frac{f_0}{F_0(S_0)} = D_0(U) - kD_1(U)D_1 - (U)_0\left[\frac{S_1}{S_0} - k\right]$$

and the results of computations are presented in a table. This formula is applicable for computing the emission of the upper atmosphere from U of 9° to the beginning of astronomic night. *Subject Headings:* **1. Twilight emission measurements 2. Upper atmosphere emission.**—*I.L.D.*

11K–77 551.521.326:535.34:546.211

Liszka, L., **Possible explanation of the diurnal variation in the intensity of the night glow line (OI) 5577 A.** *Acta Physica Polonica*, Warsaw, 15(5):305–310, **1956. DLC**—This paper discusses a possible explanation for the diurnal changes in the intensity of the green line of the night glow. These changes may be caused by periodic changes of pressure in the upper layers of the atmosphere arising from the tidal activity of the sun and the moon. The correctness of the above hypothesis can be confirmed by investigating the relation between the position of the moment of maximum green line intensity and the lunar phase. It can be seen from the curve drawn on the basis of published curves of the green-line intensity changes available to the author that such a relationship actually exists. *Subject Headings:* **1. Night airglow variations 2. Spectral line 5577 Å intensity variations 3. Atmospheric tidal effects on night airglow.**—*Author's abstract.*

11K–78 551.521.326:551.593.5

McCaulley, J. W.; Marovich, E. and Roach, F. E., **The distribution of 5577 nightglow intensities.** *U. S. National Bureau of Standards, NBS Report*, 6012, Oct. 8, **1958.** 14 figs., 4 tables, 7 refs., 4 eqs. **DWB** (M93.5 U585di)—The zenith intensities of 5577 nightglow covering from about 100 to 1,000 rayleighs have been studied at the Haute-Provence Observatory in southern France, and at two other stations during 86 nights. A study of the curves illustrated in this report indicates that the skewness of the curves is actually a discontinuity which heralds the aurora because the aurora and airglow overlap for intensities between about 300 and 500 rayleighs. The report also gives data on the distribution of absolute intensities by station as well as the percentage distribution. *Subject Headings:* **1. Night airglow intensities 2. Auroral luminosity curve 3. Haute-Provence Observatory, France.**—*N.N.*

11K–79 551.521.326:550.385

McCaulley, J. W.; Roach, F. E. (*both, Natl. Bur. of Stands., Colo.*) and Matsushita, S. (*Univ. of Colorado*), **A study of local geomagnetic influence on the (OI) 5577 nightglow emission at Fritz Peak.** *Journal of Geophysical Research*, Wash., D. C., 65(5):1499–1501, May **1960.** fig., 2 tables, 6 refs. **DLC**—A comparison is made of (1) the horizontal magnetic intensity at Leadville, Colo., and (2) the absolute zenith intensity of (OI) 5577 at Fritz Peak, Colo. The absolute zenith intensity of 5577 tends to increase as the magnetic ΔH becomes more negative. *Subject Headings:* **1. Night airglow intensity variations 3. Spectral line 5577 Å [OI] intensity variations 3. Geomagnetic effects on night airglow 4. Colorado.**—*Authors' abstract.* Ⓢ

11K–80 551.521.326

Manring, Edward R. and Pettit, H. B. (*both, G. R. D., AFCRC, Bedford, Mass.*), **The 5577 A emission of [OI] in the night airglow from Sacramento Peak, New Mexico.** *Journal of Geophysical Research*, Wash., D. C., 63(1):39–49, March **1958.** 9 figs., 5 refs., 3 eqs. **DLC**—From a photometric study of the 5577 A airglow, made during 125 nights, extending over a two-year period, from Sacramento Peak, N. Mex., the following conclusions can be drawn; (1) The regular features form a diurnal and seasonal repetitive pattern, for which the intensity during the equinoxes is brighter

than during the solstices. A diurnal and seasonal variation in the direction and amplitude of the maximum intensity is observed. This suggests a model which supposes that an intensity pattern exists on the dark side of the earth. The diurnal variation at an observing station would be due to the earth's rotation and the seasonal variation due to the change in position of the ecliptic plane with respect to the observing station. (2) The two most important sporadic features observed were arc-like structures, which appeared during six nights, and portions of auroral activity, observed during four nights. (3) From the 68 nights suitable for van Rhijn height determinations, a ratio of $I(75)/I(0) = 2.555$, corresponding to a height of 85 ± 68 km was determined. (4) A triangulation attempt was made between Sacramento Peak and Capillo Peak, with a height between 80 and 100 km indicated. (*Same item as* 9.11–205, *Met. Abstracts.*) *Subject Headings:* **1. Night airglow emission 2. Sacramento Peak, N. Mex.**—*Authors' abstract.*

11K–81 551.521.326:535.24

Megill, L. R. (*Natl. Bur. of Standards, Boulder, Colo.*), **Photometric observations of the twilight glow (OI) 5577 and (OI) 6300.** *Journal of Atmospheric and Terrestrial Physics*, N. Y., 17(4):276 285. Feb. **1960.** 7 figs., 2 tables, 11 refs., 4 eqs. **DLC**—The enhancement of both the (OI) 5577 and the (OI) 6300 atmospheric emission lines has been measured in detail for the night of Jan. 6/7, 1958 at Rapid City, S. Dak. The enhancement of the 5577 emission cannot be explained on the basis of photo excitation alone. The 6300 emission is compared with recent theory. Fair agreement is noted between theory and observation. *Subject Headings:* **1. Night airglow photometry 2. Twilight emission measurements 3. Rapid City, S. Dak.**—*Author's abstract.*

11K–82 551.521.326:551.521.16:551.593.55

Megrelishvili, T. G. and Fesenkov, V. G., **Ob issledovanii svecheniia verkhneĭ atmosfery.** [Investigations on the illumination of the upper atmosphere.] *Akademiia Nauk SSSR. Mezhduvedomstvennyi Komitet po Provedeniiu MGG [IGY], Informatsionnyi Biulleten'*, No. 5:43–44, **1958** fig. (photo), 4 refs. **DWB**—The Abastumani Astrophysical Observatory of the Academy of Sciences of the Georgian S.S.R. carries out electrophotometric and spectrographic observations of the illumination of the night and twilight skies. During the IGY the spectral constitution of the twilight sky was studied by a specially constructed electric photometer consisting of an oxide cesium light multiplier and an intensifier of constant current. The light furnishing lens is an objective 8.9 cm in diameter and a relative aperture of 1/4.5. The brightness of the twilight sky was measured in narrow bands of the spectrum divided by means of interference light filters with central wave lengths $\lambda = 840$, 658, 630, 604, 588 and 710 mμ. For fulfilling the IGY program on the night sky, a special photoelectric photometer consisting of a bismuth cesium light multiplier intensifying the constant current on a double triode was used; the light furnishing objective has a diameter of 8 cm in front of it rotated a disk with six interference light filters. By means of this photometer it is possible to obtain three fundamental emissions of the night sky, namely λ5577 O1, λ6300 O1, λ5893 aI. *Subject Headings:* **1. Night airglow photometry 2. Twilight sky brightness.**—*I.L.D.*

11K–83 551.594.51 551.521.326

†Meinel, Aden B., **The spectrum of the airglow and the aurora.** *Physical Society of London, Reports on Progress in Physics*, 14:121–146, **1951.** 5 figs., 8 tables, 60 refs. **DLC**—Begins with an account of the spectrum of the night sky from 3000–14,000 Å, consisting of bands due to various gases and a continuous background of uncertain origin. It is attributed to region below 120 km. The characteristic spectrum of the twilight glow is briefly described, and the spectrum of the aurora is discussed and illustrated in detail. The atomic and molecular processes involved are discussed. Temperature estimates from the aurora diverge widely. (*Same item as* 3.3 258 and 5C–184, *Met. Abstracts.*) *Subject Headings:* **1. Night airglow spectrum 2. Auroral spectra.**—*C.E.P.B.*

11K–84 551.521.326:551.594.51

Meinel, A. B. (*Natl. Astron. Obs. & Yerkes Obs., Williams Bay, Wis.*), **Airglow and aurora.** *Smithsonian Contributions to Astrophysics*, Wash., D. C., 1(1):95–97, **1956.** 8 refs. **DWB, DLC**—Ångstrom first observed and measured the wave length of the green auroral line in 1867. Since then many observers have been making remarkable auroral observations in order to determine the light of the night sky and the auroras. This paper describes the appearance of the light of the night sky on the spectrum of a faint astronomical object, in the different spectral regions. The characteristics of λλ4800–3100 spectrum, the region <λ3500, airglow spectrum λλ6500–4200 are also discussed. It is hoped that more data on airglow and auroras will be collected during IGY. (*Same item as* 10.6–204, *Met. Abstracts.*) *Subject Headings:* **1. Night airglow 2. Auroras.**—*N.N.*

11K–85 551.521.326

†Mitra, Sisir Kumar, **Lights from the night sky.** (In his: **The upper atmosphere.** 2nd ed. Calcutta, The Asiatic Society, **1952.** p. 485–548. 30 figs., 2 tables, 152 refs. (p. 662–666), eqs.

Asiatic Society, Monograph Series, Vol. 5). **DLC** (QC879.M49 1952). Transl. into Russian by G. V. Rozenberg and E. A. Makarov, ed. by V. I. Krasovskiĭ and Ia. L. Al'pert, with title **Svechenie nochnogo neba in Verkhnaia atmosfera.** Issued Moscow, Izdat. Inostrannoĭ Literatury, **1955.** 442–500. figs., tables, bibliog. p. 604–607 [152 refs.], eqs.) **DLC** (QC879.M497)—In Ch. IX (English ed.) the author covers in detail the following: photometric and spectroscopic studies on night airglow, excitation processes in night airglow and twilight flash, hydrogen and sodium in the upper atmosphere, etc. The sections on airglow deal with: origin of airglow, modes of excitation of its spectral components, possible causes of variations in airglow intensity, the results obtained from spectroscopic and photometric studies of the airglow, etc. The work and theories of numerous airglow researchists are discussed and/or cited frequently. Numerous figures and equations are given to explain and illustrate the text. (*Same item as* 8B–71, Feb. 1957 and 11A–13, Jan. 1960, *Met. Abstracts.*) *Subject Headings:* **1. Night airglow 2. Night airglow bibliographies 3. Translation of textbooks. I. Rozenberg, G. V.** (*transl.*) **II. Makarov, E. A.** (*transl.*)—*A.J.M.*

11K–86 551.521.326:551.594.51:535.33:546.291

†Montalbetti, R. (*Univ. Saskatchewan, Saskatoon, Canada*), **Photoelectric measurements of hydrogen emissions in aurorae and airglow.** *Journal of Atmospheric and Terrestrial Physics*, New York, 14(3/4):200–212, June **1959.** 7 figs., table, 20 refs. **DWB, DLC**—Observations are reported on hydrogen emissions in auroras and airglow made with a scanning spectrometer during the period 10–24 Feb. 1958 at Churchill, Manitoba. No systematic relationship between the occurrence of the $H\beta$ line and the usual auroral forms were noted, with the exception of very strong active displays in which hydrogen emissions were not observed. Measurements of the intensity and profile of the $H\beta$ line indicate that a proton flux of some 10^7–10^8 protons/cm² sec, with some protons having an initial velocity of $\geqslant$3000 km/sec, are associated with some auroral displays. Strong hydrogen emissions, along with enhanced airglow radiations, were detected during an interval of no visible auroras. Assuming that light scattering played an important role in the measurements, the H_χ and H_β line profiles can be explained by an influx of monoenergetic protons having an initial velocity of about 1200 km/sec. The flux for the beginning of the enhanced radiations was calculated to be the order of 10^8 protons/cm² sec. *Subject Headings:* **1. Night airglow spectra 2. Auroral hydrogen lines 3. Hydrogen lines 4. Churchill, Manitoba.**—*Author's abstract.* Ⓢ

11K–87 551.521.16

Morozov, V. M. and Shklovskiĭ, I. S., **O svechenii dnevnogo neba.** [Brightness of the sky by day.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 4:463–468, April **1956.** table, 11 refs., eq. **DLC**—The experimental results of Bedinger on the anomalous brightness of the sky by day at high altitudes are analyzed critically. From observations on the brightness of the sky during total eclipses and from other sources, the authors conclude that these observations on the brightness of the sky by day are the results of instrumental influences. *Subject Headings:* **1. Day glow 2. Daytime sky brightness.**—*Transl. of authors' abstract.*

11K–88 551.501.721:551.521.326:551.593.55(99)

Mrkos, Antonin (*Czech Acad. of Sciences*), **Nightglow and twilight in the Antarctic.** *Current Science*, Bangalore, 28(12):473–475, Dec. **1959.** 2 figs. **DLC**—A report of observations of the night sky at the Antarctic Observatory Mirny during 1957–1958. A description of instruments and methods of measurements is given. Between Feb. 24 and Oct. 12, 1958 a total of 134 measurements of the nightglow were effected. Further, 30 night measurements were carried out aboard the ships. A summary of results of nightglow intensities is reported. The Antarctic observations also included a systematic study of telescopic meteors, 131 measurements of twilight and 2 observations of noctilucent clouds and bands. Two photographs, one of Mirny Observatory and the other of aurora borealis over Mirny, illustrate the paper. *Subject Headings:* **1. Night airglow measurement techniques 2. Twilight observations 3. Antarctic airglow observations 4. Mirny, Antarctica.**—*I.S.*

11K–89 551.521.326

Nakamura, Junji (*Dept. of Physics, Univ. of Tokyo, Japan*), **Latitude effect of night airglow.** *Journal of Geophysical Research*, Wash., D. C., 62(3):487–488, Sept. **1957.** fig. **DLC.** Also: *Japan. Science Council. Ionosphere Research Committee, Report of Ionosphere Research in Japan*, 12(4):419–427, **1958.** 4 figs. **DWB, DLC**—As a result of night airglow observations on the first "Soya" (J.A.R.E.) Expedition which left Tokyo Nov. 1956, the latitude variations in airglow intensity on the outward and homeward voyage are presented graphically and discussed. A minimum intensity shows up at the geographical equator. A seasonal trend is superimposed, since there was a difference of four months between the two voyages. Three other minimums are found at 0°, +20°, and −20° geomagnetic lat. The author believes that the night airglow has two origins, UV rays and charged particles from the sun, the former being responsible for the minimum at the geographical equator and for the seasonal variations and the latter for the three minimums associated

with the geomagnetic equator. (*Same item as* 10.8–243, *Met. Abstracts.*) In the Second Japanes Antarctic Research Expedition, the measurement of the intensity of 5577 A emission was repeate as in the first expedition, on board the "Soya." The general tendency of latitude effect was almos same as in the first expedition. An analysis was made to qualify the intensity of airglow into tw parts, the stormy airglow which seems to be the effect of solar activity and the stationary airglo which is generally weak and calm. The former has not much latitude effect and the latter show latitude effect besides seasonal variation. The stationary airglow is weakest at the geographi equator, and it has secondary minima roughly between 35° and 40° of geographic latitude. *Subje Headings:* **1. Night airglow anomalies 2. Latitude effects on airglow.**—*M.R. and author's abstrac*

11K–90 551.594.51 551.521.32

†Nicholls, R. W., **Final report.** London, Ontario, Univ. of Western Ontario, Dept. of physics Molecular Excitation Group. Contract AF 19(122)-470, June 30, **1956.** 105 p. 4 tables, 101 refs +90 titles of papers published or presented at Conferences, numerous eqs.—Experimental, theoretica and interpretative researches of the Molecular Excitation Group, University of Western Ontari during 1951–1956 are reviewed in detail and contributions which the group has made to the knowledg of molecular excitation processes and basic molecular properties are emphasized. Information i also tabulated in three appendices on a) members of the Molecular Excitation Group, b) publication and orally presented papers on the work of the group and c) scientific reports issued by the group (*Same item as* 9.10–307, *Met. Abstracts.*) *Subject Headings:* **1. Auroral research 2. Airglow researc 3. Molecular excitation studies.**—*From author's abstract.*

11K–91 551.521.326:551.510.535:550.3

Nicolet, Marcel, **Deductions regarding the state of the high atmosphere.** (In: Internationa Conference on the Emission Spectra of the Night Sky and Aurorae, London, **1947, Papers.** pub **1948.** p. 36–48. 4 tables, 5 refs., 35 eqs.) **DWB**—Author states that he believes that: 1) th normal production of the night-sky light is by recombination, with selective emission; 2) nonuni formity of emission is related to ionospheric structure, meteors, etc. which vary in space and time 3) night sky light intensity correlates with magnetic activity; 4) atmospheric equilibrium is destroye during ionospheric and magnetic storms and auroral emission; the spectral distribution become more uniform as the direct effect of the corpuscles increases. Detailed treatment of identification of spectra; photodissociation and photo-ionization; molecular recombination, ionic recombinatio collisions between negative ions and neutral atoms, and application to forbidden transitions. (*Sam item as* 5C–128, *Met. Abstracts.*) *Subject Headings:* **1. Night airglow 2. Auroral emissions 3. Iono spheric structure 4. Ionization phenomena.**—*M.R.*

11K–92 551.510.535:551.521.326:546.17:546.2

†Nicolet, Marcel (*Dept. of Radiation, Royal Met. Inst., Uccle, Belgium*), **Nitrogen oxides and th airglow.** (In: **The threshold of space,** ed. by M. Zelikoff. N. Y., Pergamon Press, 1957. p. 40–57 5 figs., 48 refs., 40 eqs.) **DLC.** Also in: *Belgium. Institut Royal Meteorologique. Contributions* No. 39, **1958.** 18 p. 5 figs., 48 refs., 40 eqs. **DLC**—In considering the problem of the origin o the D region, the nitric oxide concentration may be taken to be about $5-1\times10^8$ cm^3 near 80 km an would be of the order of $5-1\times10^9$ cm^3 at 65 km, generally corresponding to a vertical distributio following the atmospheric distribution, or even decreasing more slowly than the atmospheric con stituents. Such concentrations are able to provide an interpretation of the D layer subject to th effect of Lα emitted by a quiet sun and also to the effect of solar flares above 70 km. Furthermore fluctuations occurring in nitric oxide concentrations and subject to atmospheric motions may modif the ionization rate without any variation in Lα. The theoretical considerations regarding th possible effects of nitrogen oxides in the airglow have revealed that these minor constituents canno be neglected. Since the presence of nitric oxide in the lower ionospheric region seems to be justifie in explaining its behavior, it is conceivable that nitrogen oxides play a role in the airglow. *Subje Headings:* **1. Airglow 2. Nitrogen oxide effects in airglow 3. D region.**—*A.V.*

11K–93 546.21:551.510.53:541.1

Nicolet, M. (*Inst. Royal Météorologique de Belgique, Service du Rayonnement, Uccle*), **La dis sociation de l'oxygène dans la haute atmosphère.** [The dissociation of oxygen in the high atmos phere.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A,* Vienna, 10(4):301–304 **1958.** 11 refs. French, German and English summaries p. 301. **DWB, DLC**—An aeronomi study of departures from photoequilibrium conditions in the lower thermosphere shows that th peak of atomic oxygen concentration occurs in the neighborhood of 90 km. Its vertical distributio must be associated with the airglow emission at 5577 Å and the low temperatures above the meso pause. (*Same item as* 10.8–186, *Met. Abstracts.*) *Subject Headings:* **1. Atomic oxygen distributio 2. Upper atmosphere chemistry.**—*Author's summary.*

11K–94 551.521.326:551.521.18:535.33

†Norden-Ketay Corporation, White Plains, N. Y., **Correlation of data concerning visible and near infrared radiation from the night sky.** Contract AF 18(600)-1746, Final Report 152 R 0001, Aug. 20, **1957.** 58 p. 22 figs., 23 refs. **DWB** (M21.4 N829co)—The astronomers and astrophysicists were the first to discover that the night sky was not completely dark. Realization of this fact stimulated a great deal of interest which resulted in many measurement programs designed to determine the spectral emission and intensity characteristics of the night sky. During the course of the programs, it became quite obvious that the night sky radiated measurable quantities of energy in the ultraviolet, visible, and near infrared region, the recognized trend being an increase in intensity with increased wave length. The radiation consists of line and band emissions superimposed on a strong continuum in the blue and a weak continuum in the red and infrared. The bulk of the energy is concentrated in the region bounded approximately by .7 and 1.5 microns and appears to be moderately constant throughout the course of a night. Investigators have succeeded in determining the intensities, spectral distribution, source of the energy and the variation of intensities with latitude and zenith angle. It is to be noted that most of the data, excluding absolute intensities and spectral distribution, needs to be corroborated by more numerous and conclusive investigations before being accepted with any great degree of confidence. (*Same item as* 10.3–249, *Met. Abstracts.*) *Subject Headings:* **1. Infrared spectrum of night airglow 2. Night airglow spectra.**—*Author's abstract.*

11K–95 551.521.326:535.33

Noxon, J. F.; Harrison, A. W. and Jones, A. Vallance (*all, Physics Dept., Univ. Saskatchewan, Canada*), **The infra-red spectrum of the night airglow from 1.4μ to 4.0μ.** *Journal of Atmospheric and Terrestrial Physics*, N. Y., 16(3/4):246–251, Nov. **1959.** 3 figs., 10 refs. **DWB, DLC**—The emission from the night airglow in the 1.4μ to 4.0μ region has been studied with a new infra-red spectrometer. The 9.7 OH vibration-rotation band at 2.16μ has been observed for the first time and its relative brightness has been found to be somewhat lower than has been predicted theoretically. Beyond 2.5μ thermal radiation from the lower atmosphere becomes too bright to allow the detection of further OH bands. The absolute brightness of the spectrum has been measured. *Subject Headings:* **1. Night airglow infrared spectrum 2. Infrared spectrometers.**—*Authors' abstract.* Ⓢ

11K–96 551.521.326:551.593.55:535.33:546.33

O'Brien, B. J. (*Dept. of Physics, Univ. of Iowa*), **Southern-hemisphere observations of sodium emission throughout twilight.** *Journal of Geophysical Research*, Wash., D. C., 65(1):137–140, Jan. **1960.** fig., table, 9 refs. **DWB, DLC**—A report is given of preliminary measurements in Melbourne and Antarctica of the twilight and nightglow sodium emissions. These observations were part of the program of the Australian National Antarctic Research Expeditions (ANARE). A photometer with a filter of 5 Angstrom bandwidth was used. Continuous measurements of the intensity were begun when the earth's shadow was about 20 km above the earth. The height of the sodium layer causing the twilight emission was about 90 km in both Melbourne and the Antarctic. The ratio of twilight intensity to the nightglow intensity at the end of twilight varied between 15 and 50. It is suggested that further study of the ratio may clarify several problems associated with the nightglow. *Subject Headings:* **1. Sodium emission 2. Twilight spectra 3. Night airglow emission 4. Melbourne, Australia 5. Antarctica.**—*Author's abstract.* Ⓢ

11K–97 551.521.326:535.247

O'Brien, B. J. and de la Harpe, G., **Portable airglow photometer.** *Journal of Scientific Instruments*, London, 37(2):54–56, Feb. **1960. DLC** (Unchecked)—A simple, direct-reading and sensitive photometer which is easily transported and is independent of external power supplies is described. Details of the optical system and the electronic circuitry are given, and the performance of the apparatus is discussed. *Subject Headings:* **1. Night airglow instrumentation 2. Photometers.** —*From Physics Abstracts, No.* 8416, 1960. Ⓢ

11K–98 551.521.326:535.247

Ogawa, M.; Nakamura, M. and Hashizume, A., **Photoelectric studies of near infrared OH emissions of the night sky, Pt. 1.** *Tokyo. Univ. of Education. Institute for Optical Research, Science of Light*, 5(3):139–146, Dec. **1956.** Also: Onaka, R. and Nakamura, M., **Pt. 2.** *Ibid.*, 6(3):95–100, Dec. **1957.** (In English?) (Unchecked). **DLC** (Orientalia?)—A photometer for surveying the near infrared OH emission of the night sky has been made. (1) An Ag-Cs photocell tube is used for the detector. (2) In order to eliminate the zero drift which appears in the direct dark current of the photocell, a.c. amplification is adopted. (3) A synchronous rectifier is used to reduce the noise which appears in the output of amplifier. With this arrangement, the intensity distribution of the emission and its variation with time are surveyed with an altazimuth covering the entire sky. Some problems on the estimation of the absolute intensity of OH emission in night airglow are discussed, and a method which seems best to express the absolute intensity is proposed.

In addition, a brightness standard constructed for the calibration of photometer is described. *Subj*
Headings: **1. Night airglow instrumentation 2. Night airglow intensity measurements 3. Phot**
electric photometers.—*From Physics Abstracts*, 6551 *and* 6552, 1958.

11K–99 551.521.326:551.593.55:546.33:535.

†Omholt, A. (*Yerkes Obs., Univ. of Chicago*), **Considerations regarding the sodium lines in t**
nightglow and twilight. *Journal of Geophysical Research*, Wash., D. C., 62(2):207–212, June 195
24 refs., 7 eqs. **DLC**—Some photochemical processes which may be thought of importance for t
emission of the sodium lines in twilight and nightglow are discussed. $Na+O_2+M \rightarrow NaO_2+M$
taken to be the most important oxidation process. Lack of information about the rate coefficien
involved prevents precise quantitative computations, but it is found that photochemical reactio
may explain the formation of the emitting layers and the nightglow intensity. However, no sat
factory interpretation of the large seasonal variation has so far been given. Photochemical reactio
as well as photoionization of sodium, seem insufficient to explain the observations. (*Same item*
8.10–157, *Met. Abstracts.*) *Subject Headings:* **1. Twilight sodium spectrum 2. Night airglo**
spectrum 3. Sodium lines 4. Photoionization of sodium.—*Author's abstract.*

11K–100 525.75:551.594.

Pastiels, R., **Les émissions lumineuses du ciel nocturne.** [Luminous emissions of the nig
sky.] *Ciel et Terre*, Uccle, 69(11/12):289 296, Nov./Dec. **1953.** 2 figs., table. **DLC**—Review
recent work on night airglow, twilight glow, and the aurora, especially with the spectra of the
luminous phenomena and their interpretation. Various lines and bands are identified. (*Same ite*
as 5C–261, *Met. Abstracts.*) *Subject Headings:* **1. Night airglow spectra 2. Auroral spectra 3. Tw**
light luminescence.—*M.R.*

11K–101 551.501.721:551.521.3

Perrin, M., **Mesures interférométriques sur la raie verte de la lueur nocturne.** [Interferometr
measurements on the green line of the night glow.] *Académie des Sciences, Paris, Comptes Rend*
250(13):2406-2408, March 28, **1960.** 5 refs. **DWB, DLC**—Description of a Perot and Fab
photoelectric interferometer designed for studying the line OI 5577 Å of the night glow, and stat
ment of the method for handling the interferograms. Based on a series of measurements made
Beni-Abbès in the Sahara at the beginning of 1960, and the relationship $h=7.16\cdot10^{-7}\lambda\sqrt{T/M}$ co
relating the width of the line and the temperature, one finds that the temperatures of the emissi
layer are between 175° and 235°K. *Subject Headings:* **1. Green emission layer temperature 2. F**
bry-Perot interferometer.—*A.V.* Ⓢ

11K–102 551.594.5:551.521.3

*Petrie, William and Small, R., **Additional OH lines in the airglow spectrum.** Saskatchewa
Univ. Physics Dept., Contract AF 19(122)-152, Scientific Report, No. AR-8, March **1952.** 3
table, 3 refs. **DWB**—Since the auroral spectrograph in use at Saskatoon (on all clear nights) f
the past year has a higher dispersion than those used by CABANNES, DUFAY and MEINEL, the da
listed in this report (from 40 plates) contains more OH lines than previous investigations showe
Since Saskatoon is close to zone of maximum auroral frequency, it is not so good a place to investiga
airglow. The negative N_2^+ bands appeared whether or not an aurora was visible. (*Same item*
5C–217, *Met. Abstracts.*) *Subject Headings:* **1. Night airglow spectrum 2. Spectrographs 3. Sask**
toon, Saskatchewan.—*M.R.*

11K–103 551.594

Polanyi, J. C. (*James Forrestal Res. Center, Princeton Univ., N. J.*), **A theoretical discussion**
the conditions necessary for chemiluminescence. (In: **The airglow and the aurorae: a symposiu**
London, Pergamon, **1956.** p. 346–350. 2 refs., eqs.) **DWB**—The conditions necessary for chem
luminescence are discussed for an atomic reaction $A+BC \rightarrow AB+C$. A method is outlined by whi
it should be possible to calculate the expected light-yield for a reaction of this type. The meth
consists in the calculation of the total probability that the reaction will take place with BC extend
to $\geqslant r^*_{BC}$ a critical separation corresponding to a repulsive energy between AB and $C \leqslant (/\Delta H/-Nh$
where v is the minimum frequency of the emitted light and ΔH is the heat of reaction. A prelimina
calculation indicates that the method will predict absolute light-yields in satisfactory agreeme
with the observed values for the reactions $Na+XHg \rightarrow NaX+Hg$ (X = Cl, Br, I). (*Same item*
9.4–277, *Met. Abstracts.*) *Subject Heading:* **1. Chemiluminescence.**—*Author's abstract.*

11K–104 551.521.326:535.

Prokudina, V. S., **O nabliudenii linii λ6562 Å v spektre nochnogo neba.** [Observation of li
λ6562 Å in the night-sky spectrum.] (In: Krasovskiĭ, V. I. (*ed.*), **Spektral'nye, elektrofotom**

richeskie i radiolokatsionnye issledovaniia poliarnykh siianiĭ i svecheniia nochnogo neba. Issued Moscow, Akademiia Nauk SSSR, **1959.** p. 57–59. 2 figs.) English transl. by J. Miller issued uly 1959, by American Meteorological Society, under Contract AF 19(604)-1936, as its Transl. -RC-14+.—Registration of a narrow spectral line at λ6562 Å in the night airglow spectrum is eported. *Subject Heading:* **1. Night airglow spectra.**—*Author's abstract.* Ⓢ

11K–105 551.521.326:535.24

Roach, Franklin E., **The night airglow.** *American Geophysical Union, Geophysical Monographs,* No. 2:97–101, **1958.** 11 figs., 5 refs. Also in: *Institute of Radio Engineers, N. Y., Proceedings,* 7(2):267–271, Feb. **1959.** 13 figs., 10 refs. **DLC**—The properties of the airglow and the results of estimates of its effective height by various methods are summarized. Night firing of a rocket through the emitting layer shows a sharp drop-off between 90 and 100 km for 5577 Ångstroms and between 80 and 90 km for sodium D. Triangulation between Cactus Peak and Palomar Mountain gives the best correlation between intensity changes and height of 100 km. The method of estimating airglow heights by using the rate of increase of intensity toward the horizon gives a relatively constant height of 100 km if a variable extinction coefficient is assumed. Photometric studies of the sky show that the intensity of 5577 A may vary over a two-fold or three-fold range during the night; often the entire sky goes through synchronous variations showing that the phenomenon is a large scale one of several hundred kilometers. The airglow 5577 A shows a maximum intensity at 38°N lat. and a definite seasonal variation, with the north brighter in summer and winter, and the south brighter in spring and autumn. The large airglow features are at least as large as the amount of the upper atmosphere included by a single observer—an approximate dimension of 1000 km (10^8 cm), the temporal variations seem to span several hours—a time scale of about 10^4 sec. *Subject Headings:* **1. Night airglow layer heights 2. Night airglow photometry 3. California.**—*I.L.D.*

11K–106 551.521.326:551.593.1

*Roach, F. E.; Megill, L. R.; Rees, M. H. and Marovich, E. (*all, Natl. Bur. Stan., Boulder Labs.*), **The height of nightglow 5577.** *Journal of Atmospheric and Terrestrial Physics,* London, 12(2/3):171–186, **1958.** 5 figs., 12 tables, 13 refs., 7 eqs. **DLC**—An analysis is given of observations of nightglow 5577 during twelve nights at Fritz Peak, Colo. A new photometer with a birefringent filter effectively eliminates light of astronomical origin. The heights deduced from the systematic increase of the nightglow intensity toward the horizon depend critically on the scattering and extinction of the lower atmosphere. It is found that, if a constant extinction coefficient is used in the reductions for all the nights, the spread in deduced heights is from 51 to 136 km with 100 km as the mean value. A more probable interpretation is that the actual height is 100 km and that the extinction coefficient varies from night to night. For an entire night of data the uncertainty in the extinction coefficient produces the largest error in the deduced height. On the other hand, at a given instant the spottiness of the sky is the predominant source of error. (*Same item as* 10.2–222, *Met. Abstracts.*) *Subject Headings:* **1. Night airglow layer heights 2. Extinction coefficient 3. Fritz Peak, Colo.**—*Authors' abstract.*

11K–107 551.521.326

Roach, F. E.; Tandberg-Hanssen, E. and Megill, L. R. (*all, Boulder Labs., Natl. Bu. of Standards, Colo.*), **The characteristic size of airglow cells.** *Journal of Atmospheric and Terrestrial Physics,* London, 13(1/2):113–121, Dec. **1958.** 7 figs., 4 tables, 2 refs., 4 eqs. **DLC**—Evidence is presented for the existence of discrete 5577 airglow cells in the upper atmosphere. Independent analyses are based on (a) the comparison of diurnal intensity variations in different parts of the sky and (b) the measurement of intensity gradients on airglow isophote maps. The numerical estimation of cell size is complicated by the fact that a single cell is, in general, larger than the region observable at a given location. The typical airglow cell for the 12 nights of the study has a diameter of approximately 2500 km. (*Same item as* 10.10–247, *Met. Abstracts.*) *Subject Heading:* **1. Airglow cells.**—*Authors' abstract.*

11K–108 551.521.326

Roach, F. E.; Tandberg-Hanssen, E. and Megill, L. R. (*all, Boulder Labs., Natl. Bur. of Standards, Colo.*), **Movements of airglow cells.** *Journal of Atmospheric and Terrestrial Physics,* London, 13(1/2):122–130, Dec. **1958.** 5 figs., 5 tables, 9 refs. **DLC**—The possibility of translatory and rotatory motions of airglow cells is examined. Evidence is presented for translatory motions in the 100 km region with speeds of the order of 100 m/sec. Rotatory motions are indicated corresponding to a mean period of 5 hr. A broad similarity seems to exist between airglow cell motions in the 100 km region and vortex cells near sea level. The problem of the mechanism responsible for the excitation of the oxygen atom to the *S* state is discussed with particular reference to (a) photochemical reactions and (b) environmental effects. (*Same item as* 10.10–248, *Met. Abstracts.*) *Subject Heading:* **1. Airglow cells.**—*Authors' abstract.*

11K–109 551.521.326:551.594.5:546.2

Roach, Franklin E.; McCaulley, James W. and Marovich, Edward, **Origin of (OI) 5577 in th airglow and the aurora.** *U. S. National Bureau of Standards, Journal of Research, Sec. D,* 63(1):15 18, July/Aug. **1959.** 3 figs., table. **DLC, DWB**—The distribution of 5577 zenith intensities a stations in the subauroral zone is found to be unimodal with no discontinuity at the visual threshol This is interpreted as evidence that 5577 airglow and 5577 aurora may have a common origin. *Su ject Headings:* **1. Night airglow theories 2. Origin of auroras 3. Spectral line 5577 A [OI].**— *Authors' abstract.* Ⓢ

11K–110 551.521.326:551.594.51:546.2

Roach, Franklin E.; McCaulley, James W. and Purdy, C. M., **Comparison of absolute intensitie of (OI) 5577 in the auroral and subauroral zones.** *U. S. National Bureau of Standards, Journal Research, Sec. D,* 63(1):19–20, July/Aug. **1959.** 2 figs., 4 tables. **DLC, DWB**—The distributio of 5577 zenith intensities is compared for Fritz Peak, Colo., in the subauroral zone and Thule, Gree land, near the geomagnetic pole. The absolute intensity is bright enough to permit visual detectio at the Colorado station during 2% of the time and at the Greenland station, 27% of the time. Th distribution curves have a general similarity, suggesting a phenomenological similarity in the excit tion mechanisms at the two stations. *Subject Headings:* **1. Spectral line 5577 A [OI] intensi variations 2. Night airglow intensities 3. Auroral spectral intensity.**—*Authors' abstract.* Ⓢ

11K–111 551.521.326:551.594.5:550.386

Roach, Franklin E. (*Natl. Bur. of Stands., Colo.*), **The intensity of (OI) 5577 in the subauror region as a function of magnetic activity.** *Journal of Geophysical Research,* Wash., D. C., 65(5):149 1497, May **1960.** 5 figs., 2 tables, 3 refs. **DLC**—The intensity of (OI) 5577 at Fritz Peak, Colo and Rapid City, S. Dak., is found to increase with increasing planetary magnetic activity. Th nature of the increase is similar to but smaller than that observed in the auroral zone. *Subje Headings:* **1. Night airglow intensity variations 2. Spectral line 5577 Å [OI] intensity variatio 3. Geomagnetic effects on night airglow 4. Fritz Peak, Colo. 5. Rapid City, S. Dak.**—*Author abstract.* Ⓢ

11K–112 551.521.326:550.386

Roach, Franklin E. (*Natl. Bur. of Stands., Boulder, Colo.*) and Rees, M. H. (*Univ. of Alaska*) **The absolute zenith intensity of (OI) 5577 at College, Alaska.** *Journal of Geophysical Researc* Wash., D. C., 65(5):1489–1493, May **1960.** 6 figs., 2 tables, 5 refs. **DLC**—The absolute zenit intensity of (OI) 5577 was measured over College, Alaska, at 5-minute intervals during nights fro Jan. 16 to April 8, 1959. A total of 3968 individual readings was obtained. The median intensit is 2.40 kilorayleighs. Eighty per cent of the observations are included within the range from 0.7 to 11.5 kR. A general increase of 5577 intensity occurs with increasing geomagnetic activit *Subject Headings:* **1. Night airglow intensities 2. Spectral line 5577 A [OI] intensity variation 3. Geomagnetic effects on night airglow 4. College, Alaska.**—*Authors' abstract.* Ⓢ

11K–113 551.521.326:551.594.52:546.2

Roach, Franklin E.; McCaulley, J. W.; Marovich, E. et al. (*all, Natl. Bur. of Stands., Boulde Colo.*), **A comparative study of absolute zenith intensities of (OI) 5577.** *Journal of Geophysic Research,* Wash., D. C., 65(5):1503–1511, May **1960.** 8 figs., 5 tables, 19 refs. **DLC**—The st tistical distribution of the absolute zenith intensities of (OI) 5577 is compared for four locations a north geomagnetic latitudes 49°, 53°, 65° and 88°. The distributions are similar in nature at a stations. The median values in rayleighs are 371 (49°), 251 (53°), 2400 (65°), and 630 (88°). Th percentage occurrence of intensities greater than the visual threshold is 2.2 (49°), 1.2 (53°), 83 (65° and 15 (88°). Evidence is presented for an against a single excitation mechanism for both auror 5577 and airglow 5577. *Subject Headings:* **1. Night airglow intensity distribution 2. Auroral spectr intensity 3. Spectral line 5577 A [OI] intensity variations. I. Purdy, C. M.**—*Authors' abstract.*

11K–114 551.521.326:551.594.5:535.3

*Robinson, D. and Nicholls, R. W., **Intensity measurements of molecular spectra, Pt. III, A experimental study of band intensities in O_2^+, CO and NO band systems.** London, Ontario, Uni of Western Ontario, Dept. of Physics, Contract AF 19(604)-1718, Scientific Report, No. 3, Feb. **1958.** 27 p. 7 figs., 10 tables, 17 refs. **DWB** (539 L847t)—The measurement of the relativ intensities of band systems in the spectra of the aurorae and airglow is of great importance in th study of the processes which occur in the upper atmosphere. From laboratory intensity measur ments, transition probabilities can be determined and applied to interpret the atmospheric intensiti in terms of the excitation conditions. Consequently, photographic and photoelectric techniqu have been applied to obtain the relative intensities of the following five band systems of astrophysic interest: O_2^+ Second Negative; CO Ångström; CO Third Positive; NO Gamma; NO Beta. Th

results have been used to determine the form of the electronic transition moment $R_e(r)$ and the relative transition probabilities $P_{v'v''}$ for the appropriate systems, using theoretically calculated Franck-Condon factors $q_{v'v''}$ and r-centroids $r_{v'v''}$. *Subject Headings:* **1. Night airglow intensities measurements 2. Auroral spectral intensity.**—*Authors' abstract.*

11K–115 551.521.326:535.33:546.211

Robley, Robert, **Sur l'émission des raies rouges OI dans la haute atmosphere.** [Emission of the red lines of OI in the upper atmosphere.] *Académie des Sciences, Paris, Comptes Rendus,* 243(25):2120–2122, Dec. 17, **1956.** 2 figs., 4 refs. **DLC**—Using a Blamont-Courtes photometer, curves are obtained to exhibit the time-variations of intensity of two OI emissions at 6300 and 6363 A along the NW, N, and S horizons at the Pic du Midi on the night of 9–10 April 1956. Morning and evening twilight effects are quite similar, and, from a study of the zenith-horizon intensity ratio, the altitudes of emission deduced from the measures lie between 73 and 101 km, i.e., somewhat lower than the adopted value of 110 km. *Subject Headings:* **1. Twilight spectra 2. Red spectrum of night airglow.**—*Physics Abstracts, No. 5762, June 1957.*

11K–116 551.521.326:535.33

Robley, Robert (*Observatoire du Pic du Midi*), **Variation annuelle de la lumière du ciel nocturne dans le bleu par spectrophotométrie photographique.** [Annual variation of the light of the night sky in the blue by photographic spectrophotometry.] *Annales de Géophysique,* Paris, 13(3):222–230, **1957.** 5 figs., table, 6 refs. English summary p. 222. **DLC**—Spectrophotometric research on the airglow in the range 4000 A–4500 A is reported. The intensity of the main bands 4420 A, 4170A, 4070 A shows 2 maxima in May and Oct. The absence of a close correlation between the intensity of the bands and that of the background, suggests that a real continuum is present. (*Same item as* 9.7–192, *Met. Abstracts.*) *Subject Heading:* **1. Night airglow spectrum.**—*Author's abstract.*

11K–117 551.521.326:551.594.5

Rodionov, S. F., **Elektrofotometricheskie issledovaniia svetimosti nochnogo neba.** [Electrophotometric investigations of the brightness of the night sky.] *Optika i Spektroskopiia,* Moscow, 2(5):606 615, **1957.** 3 tables, 9 graphs, 12 refs., eqs. **DLC** (QC3250.O68)—Presents the main results of the research carried out by the Physics Department of Leningrad University since 1948. Diurnal variations of infrared radiation of the night sky were disclosed. The distribution of energy in the emission spectrum of the night sky was measured in absolute units. The Galaxy was found to emit infrared radiation. Twilight radiation flashes of the upper atmosphere, both in the visible and infrared regions, were detected and studied. Diurnal variations of night-sky emission in the ultraviolet region were detected, and the distribution of this emission across the sky was measured. Positive correlation was found to exist between the infrared night sky emission and solar activity. The infrared component of auroral emission was measured. It is suggested that, to understand the mechanism of excitation of the night sky emission, one has to take into account the diffuse short wave ultraviolet light of the sun, which is present at night in the upper layers of the atmosphere, owing to anomalous refraction and secondary diffusion. *Subject Headings:* **1. Night airglow intensity measurements 2. Auroral intensities 3. Night sky brightness 4. Twilight flash.**—*From Physics Abstracts, No. 1378, March 1958.*

11K–118 551.521.326:551.590.21(234.9)

Rodionov, S. F., **Svetimost' nochnogo neba i solnechnaia aktivnost'.** [Brightness of the night sky and solar activity.] (In: Akademiia Nauk SSSR. Komissiia po Issledovaniiu Solntsa, **Fizika solnechnykh korpuskuliarnykh potokov i ikh vozdeĭstvie na verkhniuiu atmosferu zemli.** Moscow, **1957.** p. 269–272. 5 figs.) **DLC** (QB531.A5)—A curve shows the intensity of night sky radiation at 0.8 to 1.1μ during 1949–1952 with respect to solar activity, and other curves show relationships on a day-to-day basis in Sept. and in Dec. 1951 and Jan. and Aug. 1952. Data were obtained on Elbrus expeditions of GEOFIAN, SSSR at 4200 m elev. at 00 h, with a zenith angle of 80°. A good positive correlation was obtained between Wolf number and intensity of infrared night sky radiation on a long period (monthly or yearly) basis but not so good results were obtained when correlation was made on a day-to-day basis. In general, it is found that night sky infrared intensity is greatest at times of greatest solar activity. (*Same item as* 10.10–254, *Met. Abstracts.*) *Subject Headings:* **1. Night sky infrared radiation 2. Night airglow layer height 3. Solar effects on night airglow 4. Elbrus Expedition, 1949–52 5. Mt. Elbrus, U.S.S.R.**—*M.R.*

11K–119 551.593.55 551.510.536:523.59

Rozhkovskiĭ, D. A., **Fotograficheskie izofoty protivosiianiia po nabliudeniiam v 1948 i 1949 gg.** [Photographic isophotes of counterglow according to observations made in 1948 and 1949.] *Astronomicheskiĭ Zhurnal,* Moscow, 27(1):34–40, **1950.** 5 figs., 2 tables, 2 refs., 10 eqs. **DLC**—The method and results of photographic photometry of counterglow carried out in autumn 1948 and

spring 1949 at the Astrophysical Observatory of Alma Ata, with consideration of various components of the night sky luminescence, are described and explained. Author points out the variability of the shape and brightness of the counterglow and calculates its horizontal parallax. It has been found that separation of the components of night sky luminescence by FESENKOV's method brings out isophotes having definite regularities. The author indicates the possibility of interpreting these regularities by the luminescence of a complex of particles, and determines the law of the change of the spatial density of this complex. (*Same item as* 9.6–272, *Met. Abstracts.*) *Subject Headings:* **1. Counterglow 2. Night sky luminescence 3. Alma Ata, U.S.S.R.**—*A.M.P.*

11K–120 551.521.326:551.593.55:535.33

Shefov, N. N., **Intensivnosti nekotorykh emissii sumerechnogo i nochnogo neba.** [The intensity of some twilight and night sky emissions.] (In: Krasovskiĭ, V. I. (*ed.*), **Spektral'nye, elektrofotometricheskie i radiolokatsionnye issledovaniia poliarnykh siianii i svecheniia nochnogo neba.** Issued Moscow, Akademiia Nauk SSSR, **1959.** p. 33–40. 3 figs., 4 tables, 11 refs.) English transl. by J. Miller issued July 1959, by American Meteorological Society, under Contract AF 19(604)-1936, as its Transl. T-RC-14+.—Some results of observations of night airglow and twilight emissions at the Zvenigorod Station are reported. The continuum intensity distribution is measured in green and red spectral regions. Its similarity with one corresponding to the process $NO+O \rightarrow NO_2+h\nu$ is stated. Twilight continuous emission was studied in the violet spectral region. Its intensity was measured by comparing residual intensities of the Fraunhofer lines in the twilight spectra with those in the solar spectrum. The total intensity of this emission attains 0.5 erg cm^{-2} sec^{-1}. Absolute intensities of the main night airglow emissions were measured. It is stated that relative OH band intensities are in closer agreement with the computations for linear dipole momentum. *Subject Headings:* **1. Night airglow emission 2. Twilight spectra 3. Zvenigorod, Moscow Oblast, U.S.S.R.**—*Author's abstract.* Ⓢ

11K–121 551.593.55:535.33 551.521:523.74

Shklovskiĭ, I. S., **O vozmozhnom novom tipe fluorestsentsii zemnoĭ atmosfery.** [A possible new type of fluorescence of the earth's atmosphere.] *Astronomicheskiĭ Zhurnal*, Moscow, 34(1):127–130, Jan./Feb. **1957.** table, 6 refs., 2 eqs. **DLC**. Transl. into English issued in *Soviet Astronomy AJ*, N. Y., 1(1):130–132, issued **1958.** table, etc. **DLC**—As a result of cascade transitions during the resonance absorption of the solar emission line L_{β_3} by oxygen atoms of the earth's atmosphere (transition $^3P_2 - {}^3D$) infrared lines λλ11299–11287 and λ8446 will be emitted. This should lead to a twilight flash of these lines. The expected intensity of the infrared lines of oxygen during the twilight flash is calculated. For an undisturbed sun it is of the order of 10^8 photon/cm^2 sec. The line λ8446 is in the region of the band (6, 2) of the vibration-rotation spectrum of hydroxyl in the earth's atmosphere. This makes the observations of the twilight flash of the oxygen line difficult but not impossible. The author emphasizes that systematic observations of this flash give a new possibility of investigating the emission lines of the Lyman series in the solar spectrum as a function of solar activity. *Subject Headings:* **1. Twilight spectra 2. Fluorescence.**—*Author's abstract.*

11K–122 535.371:551.510.53 551.521.326:551.594.5

Shklovskiĭ, I. S. (*Inst. for Atmos. Physics, Acad. of Sci. of the U.S.S.R., Moscow*), **Elementary processes in the upper atmosphere and their manifestation in emissions.** *Annales de Géophysique* Paris, 14(4):414–424, Oct./Dec. **1958.** 17 refs., 5 eqs. **DLC**—This article is subdivided into three chapters. a) New type of fluorescence in the upper layers of the terrestrial atmosphere; b) Some remarks on the excitation of Hα emission in aurorae; c) Interplanetary gas and some geophysical problems. Of the great variety of elementary processes in the upper atmosphere, leading to the emission of various lines and bands observed in the spectra of the night airglow and aurorae, only the principal ones are discussed. Among their number is a new type of fluorescence in the upper atmosphere and also the problem of interaction of solar corpuscules with the atoms and molecules of the terrestrial atmosphere. (*Same item as* 10.8–187, *Met. Abstracts.*) *Subject Headings:* **1. Upper atmosphere 2. Fluorescence in the upper atmosphere 3. Auroral spectra 4. Night airglow spectra.**—*A.V.*

11K–123 551.521.326:546.11

Shklovskiĭ, I. S. (*Acad. of Sciences, U.S.S.R., Moscow*), **On hydrogen emission in the night glow** *Planetary and Space Science*, N. Y., London, 1(1):63–65, Jan. **1959.** 8 refs., 5 eqs. **DLC**—*H* emission has been observed at the Zvenigorod Station of the Institute for Atmospheric Physics. The width of the observed emission does not exceed the instrumental width of 2 Å. It is shown that the recombination of protons and electrons cannot account for this emission, and that a probable source is the resonance scattering of solar L_α radiation by interplanetary neutral hydrogen atoms. The possibility that L_α radiation arises from a "geocorona" is considered as is the effect of resonance scattering of L_β radiation and the intensity at H_α resulting from fluorescence when L_α and L_β are

absorbed. (*Same item as* 10.10–255, *Met. Abstracts.*) *Subject Headings:* **1. Night airglow emission 2. Hydrogen in upper atmosphere 3. Zoenigorod, Moscow oblast, U.S.S.R.**—*Author's abstract.*

11K–124 535.33:551.521.326:551.593.55

Sholokhova, E. D. and Frish, M. S., **Svetimost' sumerechnogo neba v oblasti odnogo mikrona.** [Luminescence of the twilight sky within the one micron region.] *Akademiia Nauk SSSR, Doklady*, No. 105(6):1218–1220, Dec. 21, **1955.** 2 figs., table, 9 refs. **DLC**—The authors attempt to determine the existence of twilight "flashes" (a series of emitted lines or regions produced by the luminescence of individual layers of the upper atmosphere) in the more distant infrared region near 1μ which has intense lines and fields in the spectrum of luminescence of the night sky. The actual luminescence of the sky in the 1μ region was differentiated from the total radiation diffused at twilight, the ratio of the intensity at 1μ to that at 0.7μ was determined. It was found that in the 1μ region both morning and twilight curves have a distinct maximum, so that the infrared radiation at 1μ has a distant maximum at a definite moment of twilight. In the 700–800 mμ flashes are either lacking or less distinctly expressed. The differences in behavior of these two spectral regions correspond to analogous phenomena observed during the luminescence of the night sky and of solar eclipses. The atmospheric origin of the flashes is indicated by the fact that this maximum obtained at $z=47°$ is brighter than that of $z=0°$, and a solar relationship is indicated since the later is the sunrise the later is the observed maximum. (*Same item as* 9.1–203, *Met. Abstracts.*) *Subject Headings:* **1. Twilight phenomena 2. Twilight luminescence spectra.**—*I.L.D.*

11K–125 551.521.326 551.594.51

Sommer, L. A., **Rote Sauerstoffstrahlung am Nachthimmel.** [Red oxygen radiation in the night sky.] *Naturwissenschaften*, 18(34):752, Aug. 22, **1930. DLC**—Red radiation in night sky spectrum was found and is explained as $\lambda 6300 = 2p^3P_2 - 2p^2D_2$ and $\lambda 6363 = 2p^1P_1 - 2p^1D_2$ of OI. The quantum-theoretical explanation of the green auroral line is verified. Its excitation voltage is 4.17 V, the dissociation energy is 4.17 V. The dissociation energy of the oxygen molecule is 5.09 ±0.01 V. For the discovery in laboratory experiments see PASCHEN (5C 52). (*Same item as* 5C–54, *Met. Abstracts.*) *Subject Headings:* **1. Night airglow spectrum 2. Auroral oxygen lines.** —*A.A.*

11K–126 551.521.326:535.243

Stewart, D. T., **A spectrophotometric investigation of the air afterglow.** *Journal of Atmospheric and Terrestrial Physics*, 10(5/6):318–319, **1957.** fig., 3 refs. **DWB**—The spectral energy distribution of the yellow-green glow emitted when nitric oxide and atomic oxygen combine to form nitrogen dioxide was found to be identical with that of air afterglow, with no obvious banded structure. It had a short wave-length limit at 3700–3800 Å and a flat maximum at 5400–5600 Å. (*Same item as* 8.10–158, *Met. Abstracts.*) *Subject Headings:* **1. Night airglow 2. Spectrophotometric observations.** —*C.E.P.B.*

11K–127 551.521.326:535.33:546.33

Tanaka, Yoshio (*GRD, U. S. A. F. Cambridge Res. Ctr.*) and Ogawa, Masaru (*Inst. for Optical Research, Tokyo Univ. of Education*), **On the chemiluminescence of the sodium *D* lines in the reaction between ozone and sodium vapour.** (In: **The airglow and the aurorae: a symposium.** London, Pergamon, **1956.** p. 270–272. fig., 9 refs., 2 eqs.) **DWB**—The reactions between sodium vapor and ozone, and sodium vapor and atomic oxygen, probably including metastable molecular oxygen, were investigated experimentally. It was observed that ozone reacts with sodium vapor accompanied by a strong luminescence of the *D* lines; however, the luminescence was not observed in the other reaction. If the temperature of the sodium vapor was increased in the ozone-sodium reaction, the brightness of the luminescence was reduced. On the basis of the observed evidence, two reaction formulas were tentatively suggested for the excitation of the *D* lines in the reaction. (*Same item as* 8.7–200, *Met. Abstracts.*) *Subject Headings:* **1. Twilight spectra 2. Sodium *D* line.**— *Authors' abstract.*

11K–128 551.593.55:535.33

Tanaka, Y.; Jursa, A. and Leblanc, F. (*all, GRD, Air Force Camb. Res. Cen., Mass.*), **Vacuum ultra-violet spectra of the afterglows of pure N_2 and a mixture of N_2 and O_2.** (In: **The threshold of space,** ed. by M. Zelikoff. N. Y., Pergamon Press, **1957.** p. 89 93. 2 figs., 2 tables, 8 refs.) **DLC** —Four different stages of afterglow can be produced by simply changing the O_2 partial pressure in a mixture of N_2 and O_2. In the first stage (pure N_2), the $a'\Pi g - X'\Delta g +$ bands were observed in emission, and the atomic nitrogen ^2S, ^2D, ^2P states were observed in absorption. In the succeeding three stages (blue, dark, and greenish-gray) $N(^4S)$, $O(^3P)$ and $NO(X^2\Pi)$ were observed in absorption together with several unidentified bands which appeared in the region 1400 1500 A. The reaction mechanisms are discussed briefly for each stage of the afterglow, considering both emission and

absorption spectra. (*Same item as* 9.8–286, *Met. Abstracts.*) *Subject Heading:* **1. Afterglow spectra.** —*Authors' abstract.*

11K–129 551.521.326:546.21

†Tohmatsu, Takao (*Geophys. Inst., Tokyo Univ.*), **The dynamical effect on the intensity of nightglow (O_1) λ5577.** *Japan. Science Council. Ionosphere Research Committee, Report of Ionosphere Research in Japan*, 12(3):253–267, Sept. **1958.** figs., 22 refs., eqs. **DWB**—Chapman's excitation mechanism of (O_1) λ5577 radiation in the nightglow is extended to a quantitative representation for finding the relevant connection between the theory and the observed facts of this radiation. The dynamical actions in the upper atmosphere, as well as the solar ultraviolet radiation are likely to have an important influence on the spatial and time variation of (O_1) λ5577. The elementary processes for the formation and disappearance of atomic oxygen are discussed by defining the "characteristic time" for each of these processes. The pressure effect on the emission rate is formulated on the basis of gas reaction theory, in which the concept of adiabatic change of the emission rate is introduced. The theory is tentatively applied to available observational results to give account for the solar cycle variations, the daily variation, the latitude effect and the generation and decay of inhomogeneous patches of (O_1) λ5577. *Subject Headings:* **1. Night airglow radiation 2. Spectral line 5577 A [OI].**—*Author's abstract.*

11K–130 551.521.326:551.507.362.1

Tousey, R. (*U. S. Naval Res. Lab., Wash., D. C.*), **Rocket measurements of the night airglow.** *Annales de Geophysique*, Paris, 14(2):186–195, April/June **1958.** 6 figs., 4 tables, 10 refs. French and English summaries p. 186. **DLC**—Direct measurements of the altitude of the night airglow conducted from rockets are reviewed. There have been four successful flights. The maximum of the 5577 Å layer was found to lie near 98 km: the sodium layer peaks from three flights were 85, 93 and 95 km. An ultraviolet airglow in the region 2600 to 2900 Å, presumed to be O_2 radiation in the Herzberg bands, was observed with distribution similar to the 5577 Å layer. Some data have been obtained for the continuum, certain OH bands, and the 6300 Å line of oxygen, but these results are less clear-cut. (*Same item as* 10.8–244, *Met. Abstracts.*) *Subject Headings:* **1. Rocket measurement of night airglow 2. Night airglow distribution with height.**—*Author's abstract.*

11K–131 551.594.51:551.521.326

Vassy, Arlette T. (*Univ. of Paris, Science Faculty*), **Remarks on the role of absorption in the spectrum of polar aurora and of the night sky.** London, Ontario. Univ. of Western Ontario, Dept. of Physics, Contract AF 19(122)-470, Scientific Report, No. 9, June 20, **1953.** 8 p. 11 refs. **DWB**—A free translation from French into English of remarks by Mme. Vassy as consultant to AFCRC under contract during Auroral Physics Conference at Univ. of Western Ontario, July 1951. Emphasis is placed on a careful study of absorption characteristics of night airglow and diurnal emissions passing through the atmosphere, especially when coming from low angles. Zenith measurements are more accurate, but seasonal effects can even be found in absorption due to water vapor changes, thus affecting intensities recorded. Accurate records of intensities of bands as well as positions are necessary owing to lack of dispersive power of spectrometers used for auroral and night sky measurements (the former are more dispersive and intense than the latter). Determination of intensity of emission would permit verification of statistical distribution of certain groups and levels so as to prove or disprove the current hypothesis of a state of radiative equilibrium. (*Same item as* 5C–249, *Met. Abstracts.*) *Subject Headings:* **1. Auroral spectroscopy 2. Auroral line absorption 3. Night airglow absorption 4. Atmospheric absorption. I. Hunten, Janet** (*transl.*).—*M.R.*

11K–132 551.510.5(02):551.521.326

Vassy, Etienne (*Faculty of Sciences, Paris*), **Physique de l'atmosphère, tome I, Phenomenes d'emission dans l'atmosphère.** [Physics of the atmosphere, Vol. 1, Emission phenomena in the atmosphere.] Paris, Gauthier-Villars, **1956.** 338 p. numerous figs. **DLC**—A most complete and up-to-date textbook, based on a lecture course given at the Faculty of Science in Paris. The Introduction covers in detail the methods of investigating the upper atmosphere, both direct and indirect (radiosonde, rockets, rockoons, etc.), structure, physics chemistry, including latest data; (I) Aurora: history, forms, distribution, frequency, periodicity, spectroscopy, theory, application of results to study of upper atmosphere; (II) Night airglow: measurement, color, spectroscopy, polarization, time and space variations, correlation with other phenomena (ionosphere, geomagnetic, C. R., origin, etc.); (III) Twilight emission phenomena: oxygen, sodium, nitrogen and their photoluminiscence; (IV) Meteor trail luminescence: composition, spectra, mechanism of production, Öpik's theory, results with respect to upper atmospheric winds and structure; (V) Lightning and St. Elmo's fire, Sferics (observation, geographical distribution, structure, frequency, relation to meteorological situation). The work is full of illustrations of equipment, representative data, graphs, etc. The literature on each subject is thoroughly reviewed, but no bibliographic references

or citations are included. The only other similar works are those by MITRA (*see* 4.8–15, Aug. 1953, *Met. Abstracts*) and KHRGIAN (*see* 5.7–5, July 1954, *Met. Abstracts*). (*Same item as* 8.11–1, Nov. 1957, *Met. Abstracts.*) *Subject Headings:* **1. Upper atmospheric physics 2. Emission phenomena textbooks 3. Photoluminescence 4. Auroras.**—*M.R.*

11K–133 551.594.51:551.521.326

Vegard, Lars, **The aurora and night sky spectra and the upper atmosphere: report on recent work.** *American Geophysical Union, Transactions*, 16:38–40, Aug. **1935.** 9 refs. **DLC**—Summary of work done since 1933 at Tromsø by the author, HARANG and TØNSBERG. More accurate determination of the wave length, especially in the region of long waves was undertaken. Results agree reasonably well with those found by BABCOCK (*see* 5C–31) for the green line from the night sky and with OI line ($^1S_0 - {}^1D_2$) discovered by MCLENNAN and his collaborators. Results of investigations of the line 6300 showed that it is an atomic line. (*See Geofys. Pub.*, 9(11), 1932; 10(4), 1933 and 10(5), 1933 for detailed report of work up to 1933.) (*Same item as* 5C–78, *Met. Abstracts.*) *Subject Headings:* **1. Auroral spectra 2. Night airglow spectrum 3. Auroral wavelength measurement.**—*M.L.R.*

11K–134 551.521.326:535.34:546.211

Wark, D. Q., **Doppler widths of the atomic oxygen lines in the airglow.** *Astrophysical Journal*, Chicago, 131(2):491–501, March **1960.** (Unchecked.) **DLC**—The widths of the forbidden atomic oxygen lines in the airglow have been measured, using a Fabry-Perot interferometer, and temperatures of the emitting layers have been inferred. The lines λ5577 in the night sky and λ6300 in the twilight, the aurora, and the night sky yielded temperatures of 184°, 710°, 730°, and 980°K, respectively, with mean-square errors of about 10%. Corresponding tentative heights of the emitting layers have been suggested as 100, 205, 210, and 270 km. *Subject Headings:* **1. Oxygen lines 2. Doppler displacement of oxygen lines 3. Night airglow layer heights 4. Auroral temperatures 5. Auroral height estimates.**—*From Physics Abstracts, No. 8412, June 1960.* Ⓢ

11K–135 551.594.5 551.557 551.521.326

Wulf, Oliver R. (*U. S. W. B., California Institute of Technology, Pasadena, California*), **On the production of glow discharges in the ionosphere by winds.** *Journal of Geophysical Research*, 58(4): 531–538, Dec. **1953.** 2 figs., 15 refs. **DLC**—It is suggested that a source is to be found in potential differences generated by zonal ionospheric winds cutting the earth's magnetic field. A return path of current flow (glow discharge) in the higher ionosphere appears plausible. The principal effect in this process arises from the cutting of the vertical component of the field by broad horizontal winds. An auroral zone results as the region where the product of wind velocity and vertical field intensity has a maximum. From this point of view, the aurora and the airglow (at least a portion of it) are manifestations of the same thing. The aurora occurs under high excitation when the winds are strong in high latitudes, while this portion of the airglow is always present in some measure in most latitudes, arising from lower velocity winds. Patterns in the large-scale air circulation should lead to patterns in the intensity of the emission, and the regular diurnal disturbance of these upper atmosphere zonal winds should lead to diurnal features in the aurora and airglow. (*Same item as* 5C–262, *Met. Abstracts.*) *Subject Headings:* **1. Auroras 2. Night airglow 3. Ionospheric winds.**—*Author's abstract.*

11K–136 551.521.326:535.247

Fishkova, L. M. and Markova, G. V., **Nekotorye rezul'taty elektrofotometricheskikh nabliudenii emissii OI, Na, OH i nepreryvnogo fona v svecheniĭ nochnogo neba.** [Some results of the electrophotometric observations of the OI, Na, OH emissions and continuum in the night glow.] *Abastumani, USSR. Astrofizicheskaia Observatoriia, Biulleten'*, No. 24:161–173, **1959.** 8 figs., 4 tables, 18 refs. English summary p. 173. **DLC**—The total intensity of the airglow OH bands in the near infrared and intensity of the (OI) 5577, (OI) 6300, Na 5893 airglow emissions have been measured at the Abastumani Astrophysical Observatory within the period from July 1957 to June 1958. The value obtained for the mean total intensity of the OH (8–4), (3–0), (9–5), (4–1) bands is 19400 rayleighs; this value is 30 percent greater than in 1954–55; seasonal variations of the OH emission in 1957–58 have more irregular character than in 1954–55. The slight increase in the OH intensity correlates with maximum of solar activity in 1957–58. The diurnal variations of the OH intensity in the same years have minimum at midnight and maximum between 2 h and 4 h local time. The (OI) 5577 intensity has diurnal maximum near midnight and precedes the OH intensity by 2–3 hours; the diurnal variations of the Na 5893 intensity correlate with the OH bands; the (OI) 6300 emission is more intensive at the beginning and at the ending of night. The continuum intensity has been measured at λλ5290 Å, 5730 Å, 6060 Å, its diurnal variations are either independent or parallel to the (OI) 5577 or OH. The seasonal variations of the continuum intensity have two maxima—a large one in January and a small one in June. It is assumed that the continuum consists

of three components; a) the emission of the upper atmosphere, b) the nonresolved bands, c) the scattered solar light. *Subject Headings:* **1. Electrophotometric observations of airglow 2. Night airglow intensity distribution.**—*Authors' abstract.* Ⓢ

11K–137 551.521.326:535.33

Tohmatsu, Takao (*Geophys. Inst. Tokyo Univ.*), **Notes on the nightglow continuum near λ5300 A.** *Japan. Science Council. Ionosphere Research Committee, Report of Ionosphere Research in Japan*, 12(2):169-173, June **1958.** 2 figs., table, 8 refs., 4 eqs. **DWB**—An analysis of the night-sky light near λ5300 A is made by using the result of two-color photometry of the oxygen green line (O_1) λ5577 and the night-sky background near λ5300 A. The considerable change of brightness of the night-sky background from night to night is mainly due to existence of the nightglow continuum in this spectral region. On ordinary nights when the brightness of (O_1) λ5577 is moderate, the night-sky light near λ5300 A is composed of 60 to 70 per cent of astronomical lights (faint stars, galactic light and zodiacal light) and 30 to 40 per cent of the nightglow continuum. The close correlation between the intensities of (O_1) λ5577 and the nightglow continuum reported by BARBIER (1955) is re-examined with successful confirmation. The height of the emitting layer estimated by the "zenith to horizon method" is about 100 km and is equal to the height of (O_1) λ5577 radiation. *Subject Headings:* **1. Night airglow continuum 2. Photometric night airglow measurement techniques.**—*Author's abstract.*

11K–138 535.33:551.521.326:551.593.55

†Volz, F. and Goody, R. M., **Twilight intensity at 20° elevation.** Blue Hill Meteorology Observatory, Contract AF 19(604)-4546, Scientific Report, No. 1, Jan. **1960.** 46 p. 16 figs. (incl. photos), 7 tables, 34 refs., 7 eqs. **DWB**—A photometer has been designed which can measure the absolute intensity of the twilight in five narrow bands of wave lengths from the red to the ultraviolet region of the spectrum, for sun depressions up to 18°. A theoretical analysis of the twilight intensity for a pure molecular atmosphere and some plausible dust models indicates that the influence of dust on the late twilight scattering is small, but measurable if precise absolute methods are employed. Gradients of the logarithm of intensity and color ratios provide complex but sensitive indicators of dust scattering. The influence of ozone absorption is discussed. The interpretation of the twilight by BIGG (1956) is shown to be seriously in error. Two observations of the twilight are discussed briefly in terms of the theoretical models. Conclusions about the dust distribution are not possible without making an exact fit to the twilight intensity curve for all wave lengths and sun depressions. Measurements of the night sky intensity caused by starlight, airglow and city lights indicate that useful information can be obtained up to 120 km for observations in blue light and up to 75 km for observations in red light. Observing from a site free from city lights could increase these heights by 10 km. *Subject Headings:* **1. Twilight intensity calculation 2. Night sky photometers 3. Night airglow measurement techniques.**—*Authors' abstract.* Ⓢ

11K–139 535.33:546.211:551.521.326

Wallace, L. (*Yerkes Obs., Univ. Chicago*), **Note on airglow temperature determinations from OH spectra.** *Journal of Geophysical Research*, Wash., D. C., 65(3):921–923, March **1960.** 2 tables, 18 refs., 6 eqs. **DLC**—It is shown that the use of the approximate energy relation $F(J) = B_v J(J+1)$ in the determination of OH airglow rotational temperatures causes the temperatures determined from the P_1 branch to be about 8% too large. Corrections are applied to the previously determined temperatures. *Subject Headings:* **1. Night airglow investigations 2. Oxygen spectra.**—*Author's abstract.* Ⓢ

SUPPLEMENTARY MATERIAL

11K–140 551.521.326:551.507.362.1

Koomen, M., **Observations of the night airglow from rockets.** *International Council of Scientific Unions, Brussels, Ninth Report of the Study of Solar and Terrestrial Relationships.* Pub. Paris, **1957.** pp. 99–102. fig., 14 refs. **DWB**—The Naval Research Laboratory has flown four successful Aerobee rockets which have had some part of their instrumentation devoted to the measurement of the night airglow. All rockets were launched from White Sands Proving Grounds in New Mexico. The instrumentation used is described and the measurements obtained are tabulated. A sample of the results obtained on the second rocket flight is included. The heights measured for λ5577 emission are in good agreement in the three flights and suggest that the mechanism involved is the triple collision of three oxygen atoms proposed by CHAPMAN. This mechanism gives a maximum intensity at about 100 km. The rocket results lead to the conclusion that the D lines in the night airglow are excited chemically, probably by the same reaction that maintains the supply of

sodium atoms required for the resonance radiation of the twilight flash. The 6257 Å emission occurs at different altitudes than the 5320 Å emission; the latter arises from something other than OH. *Subject Headings:* **1. Rocket airglow observations 2. Night airglow spectra 3. Sodium D line emission.**—*E.Z.S.*

11K–141 551.521.326:551.521.18

Moroz, V. I. (*P. K. Shternberg State Astronomical Inst.*), **Night-airglow infrared emission spectrum to 3.4μ.** *Soviet Astronomy AJ*, New York, 4(1):118–124, July/Aug. **1960.** 5 figs., 4 tables, 14 refs., eq. **DLC.** Transl. of original Russian in *Astronomicheskii Zhurnal*, Moscow, 37(1):123–130, Jan./Feb. **1960. DLC**—AN IR spectrometer with a PbS photoconductive cell was used to record the night-airglow emission spectrum in the broad spectral interval from 1.2–3.4μ. In the 1.2–2.0μ region, the results were found to be in excellent agreement with the finding of GUSH, JONES, and HARRISON. The region $\lambda > 2.0\mu$ was studied for the first time. No intense emission bands of any kind were found in the 2.1–2.5μ region, which is comparatively free from tropospheric absorption lines. A weak maximum near the 2.1–2.2μ was identified with the 9–7 OH band at $\lambda 2.145\mu$. The thermal-emission spectrum of the troposphere was recorded in the 2.6–3.4μ region. Near 3.2μ, a clearly delineated band structure was observed, and was identified with the inverted absorption spectrum of water vapor in the troposphere. Absolute intensities were found for the 8–5, 3–1, 4 2, 5–3, and 9–7 bands of OH, and were compared to theoretical predictions. The intensity ratios of bands having common upper levels, obtained by drawing upon observational data reported by other authors, show better agreement with the Einstein coefficients computed by I. S. SHKLOVSKII than with the second approximation of HEAPS and HERZBERG. The intensities of the bands which were not studied (3–2, 4–3, 5–4, and 9–8), were calculated, and the possibility of studying the band sequence $\Delta V = 1$ are discussed. *Subject Headings:* **1. Night airglow spectra 2. Infrared spectrum of night airglow.**—*Author's abstract.* Ⓢ

11K–142 551.510.4:546.31/2:551.521.326

Perrin, M. and Vassy, A., **Perturbations subies par la raie verte de la lueur nocturne lors de l'éjection de métaux alcalins à l'aide de fusées.** [Perturbations undergone by the green line of the night airglow at the time of alkaline metals ejection by means of rockets.] *Académie des Sciences, Paris, Comptes Rendus*, 250(15):2740–2741, April 11, **1960.** fig., 2 refs. **DWB, DLC**—An alkaline mixture, sodium and potassium, was ejected in the upper atmosphere by means of a *Véronique* type rocket. The perturbation caused by this ejection was observed with an interferometer of the Perot-Fabry type installed at Béni-Abbès (Sahara). A deep modification of the [OI] 5577 Å line profile was observed and very enlarged and unsymmetrical fringes recorded. The ejection of alkalines accounts for the perturbation brought to the oxygen atoms emitting the green line, and this for a fairly long period. The cause of this dissymmetry might be found in a Doppler-Fizeau effect if admitting that the OI atoms are animated by upward motions due to shocks with potassium atoms; this anisotropy in OI atom speeds is due to the fact that at relatively low altitudes, speeds equalization occurs almost instantaneously while equalization is lower towards 180 km. On the other hand, the ejection of alkalines entails the formation of a cloud with strong electron density, cloud becoming larger through diffusion with time. The presence of this cloud of electrons acts on the oxygen atoms and modifies the lines profile by the Stark effect. *Subject Headings:* **1. Spectral line 5577 Å [OI] intensity variations 2. Night airglow photometry 3. Alkaline injection in upper atmosphere 4. Véronique rocket 5. Béni-Abbès, Algeria.**—*A.V.* Ⓢ

PART III. ANALYTICS FROM SERIALS AND COLLECTED WORKS

Note: Material listed in these sections will not be included in the monthly indexes until abstracted.

Akademiia Nauk SSSR, Izvestiia, Ser. Geofizicheskaia, No. 7, July 1960

Popov, V. V.: **O temperaturnykh deformatsiiakh zemnoĭ poverkhnosti,** [Thermal deformations of the earth's surface], p. 913–921

Golovina, I. F. and Malov, N. N.: **K teorii geĭzerov,** [Theory of geysers], p. 922–929

Molotova, L. V. and Vasil'ev, Iu. I.: **O velichine otnosheniia skorosteĭ prodol'nykh i poperechnykh voln v gornykh porodakh. I,** [Magnitude of the relationship between longitudinal and transverse wave velocities in rocks], p. 930–945

Volarovich, M. P. and Bondarenko, A. T.: **Issledovanie elektricheskogo soprotivleniia v obraztsakh gornykh porod pri vsestoronnem davlenii do 1000 kg/cm²,** [Investigation of the electrical resistance of rock samples under an all-side pressure of 1000 kg/cm²], p. 946–953

D'iakonov, B. P.: **Asimptoticheskie vyrazheniia dlia elektromagnitnykh poleĭ tsilindricheskoĭ neodnorodnosti,** [Asymptotic expressions for electromagnetic fields of cylindrical inhomogeneity], p. 954–958

Kovalev, O. I. and Molotova, L. V.: **Udarnoe skvazhinnoe ustroĭstvo dlia vozbuzhdeniia uprugikh voln raznykh tipov,** [Impact device for the generation of elastic waves of various types], p. 959–969

Grabovskiĭ, M. A.; Zherdenko, O. N. and Skovorodkin, Iu. P.: **O vozmozhnosti primeneniia magnitnogo poroshka pri izuchenii veshchestevennogo sostava zheleznykh rud,** [Possibility of using magnetic powder in the study of the composition of iron ore], p. 970–973

Valiev, A. A.: **Opyt paleomagnitnogo raschleneniia Marguzarskogo razreza kaĭnozoĭskikh kontinental'nykh molassovykh formatsiĭ (Severnaia Fergana),** [Attempt at the paleomagnetic differentiation of the Marguzarsk layer of Cenozoic continental Molassic formations (northern Fergana)], p. 974–976

Barsukov, O. M.: **O sviazi effekta khromosfernykh vspyshek s geomagnitnoĭ aktivnost'iu (po nabliudeniiam 1957–1959 gg.),** [The relation between the effect of chromospheric flares and magnetic activity (according to observations in 1957–1959)], p. 977–978

Strakhov, V. N.: **O vychislenii vertikal'nogo gradienta dvukhmernykh magnitnykh poleĭ,** [Calculation of the vertical gradient of two-dimensional magnetic fields], p. 979–987

Kopaev, V. V. and Martynova, T. A.: **O magnitnoĭ vospriimchivosti zhelezistykh kvartsitov Starooskol'skogo zhelezorudnogo raĭona KMA,** [Magnetic susceptibility of ferrous quartzites of the Stary Oskol iron bearing area of the Kursk magnetic anomaly], p. 988–997

Gliuzman, A. M. and Plokhikh, N. A.: **Reshenie nekotorykh ploskikh zadach v elektrorazvedke,** [Solution of certain plane problems in electrical surveying], p. 998–1004

Popov, V. V. and Cherniavkina, M. K.: **Nekotorye rezul'taty nabliudeniĭ nad deformatsiiami zemnoĭ poverkhnosti na geofizicheskoĭ stantsii "Ialta,"** [Certain results of observations of the deformation of the earth surface at the geophysical station "Ialta"], p. 1005–1012

Shuleĭkin, V. V.: **Vychislenie razmerov voln, vozmozhnykh pri atlanticheskikh uraganakh,** [Calculation of the possible size of waves during Atlantic hurricanes], p. 1013–1021

Tareev, B. A.: **K teorii konvektsionnoĭ tsirkuliatsii v glubokovodnykh vpadinakh okeana,** [Theory of convective circulation in deep ocean depressions], p. 1022–1029

Feĭgel'son, E. M.: **Raschet radiatsionnogo vykholazhivaniia oblakov,** [Calculation of the radiational cooling of clouds], p. 1030–1041

Gurvich, A. S.: **Chastotnye spektry i funktsii raspredeleniia veroiatnosteĭ vertikal'noĭ komponenty skorosti vetra,** [Frequency spectra and functions of the probability distribution of the vertical component of wind velocity], p. 1042–1055

Laktionov, A. G. and Levin, L. M.: **Sravnitel'nye izmereniia kontsentratsii i funktsii raspredeleniia chastits vodnykh aerozoleĭ,** [Comparative measurements of the concentration and distribution function of water aerosol particles], p. 1056–1058

Beliaev, V. I.: **Uravneniia kristallizatsii pereokhlazhdennogo oblaka s uchetom koaguliatsii,** [Equation of the crystallization of a supercooled cloud, taking coagulation into account], p. 1059–1068

Iampol'skiĭ, A. D.: **O primenenii garmonicheskogo analiza dlia obrabotki materialov gidrologicheskikh nabliudeniĭ,** [Use of harmonic analysis in the analysis of hydrological observation data], p. 1069–1071

Popov, S. M.: **O vliianii formy beregovoĭ linii na dinamicheskie rezhimy vetra,** [Influence of the form of a shoreline on dynamic wind regimes], p. 1072–1076

Gandin, L. S. and Soloveĭchik, R. E.: **O rasprostranenii radioaktivnoĭ emanatsii v prizemnom sloe atmosfery,** [Distribution of radioactive emanations in the air layer near the ground], p. 1077–1081

Pogorelov, V. I.: **Sopostavlenie parametrov radiootrazheniĭ s variatsiiami magnitnogo polia vo vremia poliarnykh siianiĭ,** [Comparison between radio-reflection parameters and variations of the magnetic field during auroras], p. 1082–1085

Krylov, P. A.: **Bimetallicheskiĭ pirgeliometr,** [Bimetallic pyrheliometer], p. 1086–1090

Brodskaia, S. Iu.: **III paleomagnitnaia konferentsiia,** [Third Paleomagnetic Conference], p. 1091–1096

No. 8, Aug. 1960

Molotova, L. V. and Vasil'ev, Iu. I.: **O velichine otnosheniia skorosteĭ prodol'nykh i poperechnykh voln v gornykh porodakh, II,** [Magnitude of the relation between longitudinal and transverse wave velocities in rocks, Pt. 2], p. 1097–1116

Zaĭtsev, L. P.: **O vyrozhdennykh golovnykh volnakh v uprugoĭ srede s granitseĭ-razdela,** [Decayed head waves in an elastic medium with a boundary surface], p. 1117–1123

Dmitriev, V. I.: **Reshenie osnovnoĭ zadachi teorii induktsionnogo metoda elektrorazvedki,** [Solution of the basic problem in the theory of the induction method in electrical surveying], p. 1124–1134

Shamina, O. G.: **Izuchenie dinamicheskikh kharakteristik prodol'nykh voln v sloiakh razlichnoĭ tolshchiny,** [Study of the dynamic characteristics of longitudinal waves in layers of varying thicknesses], p. 1135–1148

Ivakin, B. N.: **Metody upravleniia plotnost'iu i uprugost'iu sredy pri dvumernom modelirovanii seĭsmicheskikh voln,** [Methods of controlling the density and elasticity of a medium in the two-dimensional modelling of seismic waves], p. 1149–1167

Gzovskiĭ, M. V.; Krestnikov, V. N.; Leonov, N. N.; Rezanov, I. A. and Reĭsner, G. I.: **Karta noveĭshikh tektonicheskikh dvizheniĭ Sredneĭ Azii,** [Map of the newest tectonic movements in Central Asia], p. 1168–1172

Zverev, S. M.: **Zapisi vodnykh voln v okrestnostiakh granitsy zony teni, obrazovannoĭ dnom moria,** [Records of water waves in the vicinity of the boundary of the shadow zone created by the sea bottom], p. 1173–1186

Fridman, Sh. D.: **Ob issledovaniiakh spektral'nogo sostava γ-izlucheniia gornykh porod v estestvennom zaleganii,** [Investigations of the spectral composition of the gamma radiation of rocks under natural conditions], p. 1187–1197

Volarovich, M. P.; Levykin, A. I. and Sizov, V. P.: **Issledovanie zatukhaniia uprugikh voln v obraztsakh gornykh porod,** [Investigation on the damping of elastic waves in rock samples], p. 1198–1203

Kozulin, Iu. N.: **K teorii chastotnogo elektromagnitnogo zondirovaniia mnogosloĭnykh struktur,** [Theory of frequency electromagnetic sounding of multilayered structures], p. 1204–1212

Valiev, A. A.: **Opredelenie polozheniia poliusov zemli v tretichnoe vremia na osnovanii izucheniia ostatochnoĭ namagnichennosti gornykh porod nekotorykh raĭonov severnoĭ Fergany,** [Determination of the position of the poles of the earth during the Tertiary period on the basis of a study of the residual magnetization of rocks in certain regions of northern Fergana], p. 1213–1215

Popov, E. I.: **Opyt nabliudeniĭ sil'no zagashennymi gravimetrami na samolete i vertolete,** [Experiment on observations with greatly damped gravimeters from airplanes and helicopters], p. 1216–1219

Skur'iat, A. N.: **Malogabaritnyĭ osvetitel' (MO) dlia naklonomernoĭ i seĭsmicheskoĭ registratsii,** [Small illuminator (MO) for inclinometric and seismic recording], p. 1220–1222

Monakhov, F. I.: **Seĭsmologiia v Iugoslavii,** [Seismology in Yugoslavia], p. 1227–1228

Ryng, S. I.: **Ob odnom vide pomekh, nabliudaemykh pri registratsii zemnykh tokov,** [A type of disturbance observed during the recording of earth currents], p. 1228

Mikhaĭlov, V. I.: **K teorii rasseianiia elektromagnitnykh voln na poverkhnosti moria,** [Theory of the scatter of electromagnetic waves at the sea surface], p. 1229–1233

Ozmidov, R. V.: **O skorosti dissipatsii turbulentnoĭ energii v morskikh techeniiakh i o bezrazmernoĭ universal'noĭ v "zakone 4/3,"** [Speed of dissipation of turbulent energy in sea currents and the dimensionless universal in the "4/3 law"], p. 1234–1237

Feĭgel'son, E. M.: **Nekotorye voprosy radiatsionnogo teploobmena v sloistykh oblakakh,** [Certain problems of the radiational heat exchange in stratiform clouds], p. 1238-1245

Malkevich, M. S. and Glazova, K. S.: **Ob izmenchivosti nekotorykh parametrov, primeniaemykh dlia rascheta potokov rasseiannoĭ radiatsii,** [Variability of certain parameters used for calculating the flux of scattered radiation], p. 1246–1251

Tsvang, L. R.: **Izmereniia chastotnykh spektrov temperaturnykh pul'satsiĭ v prizemnom sloe atmosfery,** [Measurements of the frequency spectra of temperature fluctuations in the air layer near the ground], p. 1252–1262

Tammet, Kh. F.: **K teorii aspiratsionnykh schetchikov aeroionov,** [Theory of the aspiration air ion counter], p. 1263–1270

Nemchinov, S. V.: **Prognoz polia atmosfernogo davleniia na srednem urovne atmosfery s uchetom gorizontal'nogo krupnomasshtabnogo turbulentnogo peremeshivaniia,** [Forecasting the atmospheric pressure field at the mean level of the atmosphere, taking into account horizontal large scale turbulent mixing], p. 1271–1276

Vaĭsberg, O. L.: **Pervye nabliudeniia spektrov poliarnykh siianiĭ s fotoelektricheskim spektrometrom,** [First observations of auroral spectra with the photoelectric spectrometer], p. 1277–1278

Beliaev, V. I.: **Ob opredelenii kriticheskogo razmera zarodyshevykh kristallov,** [Determination of the critical size of crystal nuclei], p. 1279–1281

Sadokov, V. P.: **O printsipial'nykh oshibkakh v teoreticheskikh osnovakh metoda dolgosrochnykh prognozov pogody maloĭ zablagovremennosti,** [Errors of principle in the theoretical bases of the method of long range weather forecasting a short period in advance], p. 1282–1284

Buchinskiĭ, I. E.: **Soveshchanie v oblasti geliogeofiziki,** [Conference in the field of heliogeophysics], p. 1287–1288

Akademiia Nauk SSSR. Institut Fiziki Zemli, Trudy, No. 4 (171), 1959

Kalashnikov, A. G.: **O metodicheskikh rabotakh, vypolnennykh Vostochnoĭ neftegazovoĭ ekspeditsieĭ v Zapadnoĭ Sibiri,** [Methodological work conducted by the Eastern Petroleum Expedition in western Siberia], p. 3–7

Shneerson, B. L.: **Issledovanie gravitatsionnogo polia Sibiri,** [Investigation of the gravitational field in Siberia], p. 8–21

Enenshteĭn, B. S.: **O dlinnykh elektricheskikh zondirovaniiakh na postoiannom toke, poluchennykh potentsiometricheskoĭ metodikoĭ,** [Long d-c electric soundings obtained by the potentiometric method], p. 22–43

Bladitirov, N. P.: **K voprosu o vozmozhnosti primeneniia elektricheskogo metoda razvedki v usloviiakh Zapadnoĭ Sibiri,** [Possibility of using the electric survey method under conditions in western Siberia], p. 44–59

No. 6 (173), 1959

Epinat'eva, A. M.: **Nekotorye rezul'taty analiza formul dlia amplitud prelomlennykh voln,** [Certain results of the analysis of formulas for the amplitude of refracted waves], p. 7–51

Vasil'ev, Iu. I.: **Nekotorye sledstviia iz analiza koeffitsientov otrazheniia i prelomleniia uprugikh voln,** [Certain conclusions from the analysis of the reflection coefficients of refracted elastic waves], p. 52–80

Starodubrovskaia, S. P.: **K metodike priblizhennykh raschetov teoreticheskikh seĭsmogramm voln voznikaiushchikh v tonkosloistykh sredakh,** [Method of approximate calculation of theoretical seismograms of waves arising in thin-layered media], p. 81–106

Berzon, I. S.: **Ob izmenenii s rasstoianiem amplitud voln otrazhennykh ot tonkogo sloia,** [Change with distance of the amplitude of waves reflected from a thin layer], p. 107–113

Isaev, V. S.: **O zavisimosti preobladaiushcheĭ chastoty spektra impul'snogo kolebaniia ot chisla vidimykh periodov impul'sa,** [Dependence of the predominant frequency of the spectrum of pulse oscillations on the number of visible pulse periods], p. 114–119

Khudzinskiĭ, L. L.: **O chastotnom analize v zone interferentsii seĭsmicheskikh voln,** [Spectral analysis in the interference zone of seismic waves], p. 120–135

Isaev, V. S.: **Ob izmenenii spektrov voln pri gruppirovanii seĭsmografov,** [Change in wave spectra when grouping seismographs], p. 136–162

Berzon, I. S.: **Opredelenie spektra koeffitsienta otrazheniia prodol'nykh voln ot tonkogo sloia,** [Determination of the spectrum of the reflection coefficient of longitudinal waves from a thin layer], p. 163–186

Rats-Khizgiia, M. I.: **Ob osrednenii nabliudennykh dannykh pri postroenii grafikov izmeneniia amplitud seĭsmicheskikh voln s rasstoianiem,** [Averaging observational data during the construction of graphs of the change in the amplitude of seismic waves with distance], p. 187–194

Ivanova, T. G.: **Eksperimental'nye dannye o vliianii sloia v verkhneĭ chasti razreza na ugly vykhoda voln razlichnoĭ chastoty,** [Experimental data on the effect of a layer in the upper portion of a profile on the angle of exit of waves of varying frequencies], p. 195–212

Berzon, I. S.: **Nekotorye voprosy interpretatsii godografov obmennykh otrazhennykh voln,** [Certain problems of the interpretation of hodographs of changeable reflected waves], p. 213–236

Molotova, L. V.: **O registratsii glubinnykh otrazheniĭ pri seĭsmorazvedke,** [Recording reflections from great depths during seismic soundings], p. 237–252

Ratnikova, L. I.: **O poverkhnostnykh volnakh, zaregistrirovannykh vblizi istochnika,** [Surface waves recorded near the source], p. 253–282

Pariĭskaia, G. N.: **Izuchenie poverkhnosti vertikal'no-sloistoĭ sredy so slozhnym rel'efom po sistemam prodol'nykh seĭsmicheskikh profileĭ,** [Study of the surface of a vertically stratified medium with a complicated relief from systems of longitudinal seismic profiles], p. 283–319

Bokanenko, L. I.: **K voprosu o kontrole chuvstvitel'nosti seĭsmoregistriruiushchikh kanalov,** [Control of the sensitivity of seismic recording channels], p. 320–335

Melamud, A. Ia. and Shipilin, N. S.: **Vysokochastotnaia seĭsmicheskaia apparatura,** [High-frequency seismic equipment], p. 336–354

Sorokhtin, O. G.: **Mnogokanal'nyĭ impul'snyĭ ul'trazvukovoĭ seĭsmoskop,** [Multichannel ultrasonic impulse seismoscope], p. 355–374

Annales d'Astrophysique, Paris, Vol. 22, No. 5, Sept./Oct. 1959

Arsac, J.: **Sur la scintillation atmosphérique observée en ondes centimétriques,** [Atmospheric scintillation observed in centimeter waves], p. 447–467

Ueno, Sueo: **The probabilistic method for problems of radiative transfer, Pt. 9, Diffuse reflection and transmission in a finite atmosphere with isotropic scattering in the non-conservative case,** p. 468–483

Ueno, Sueo: **The probabilistic method for problems of radiative transfer, Pt. 11, On the scattering and the transmission functions of S. Chandrasekhar,** p. 484–490

Michard, Raymond: **La raie Hα dans la chromosphère,** [The chromospheric Hα line], p. 547–570

Rösch, Jean: **Observations sur la photosphère solaire, Pts. 1–2,** [Observations of the sun's photosphere, Pts. 1–2], p. 571–607

Beiträge zur Physik der Atmosphäre, Frankfurt a.M., Vol. 33, No. 1/2, 1960

Müller, Hans Gerhard: **Impfversuche mit Silberjodid in unterkühltem Nebel,** [Experiments on the seeding of supercooled fog with silver iodide], p. 1–8

Arnulf, A. and Bricard, J.: **Bericht über die jüngsten Untersuchungen zur Lichtdurchlässigkeit von Nebel und Dunst und deren Beschaffenheit, die im optischen Institut in Paris durchgeführt wurden,** [Report on the latest investigations on light transmission of fog and mist and of its nature, which were conducted in the Optical Institute in Paris], p. 9–27

Foitzik, L.: **Bestimmung der Schrägsicht nach einer Komponentenmethode,** [Determination of slant visibility according to a component method], p. 28–35

Früngel, F.: **Der "Skopograph": ein Flugplatz-Transmissometer mit Impulslicht,** [The "Skopograph": an airfield transmissometer with impulse light], p. 36–52

Stauffert, Fritz: **Schrägsichtmessung mit einer Fernsehanlage,** [Slant visibility measurement with a television apparatus], p. 53–56

Goes, O. W.: **Registrierung der Sichtweite auf einem Flughafen,** [Recording the visual range at an airport], p. 57–67

Wiesemann, Marlies: **Über die Ausbildung von Ringzellen zwischen einer gut und einer schlecht leitenden festen Grenzfläche,** [Formation of ring cells between a well and a poorly conducting solid interface], p. 68–100

Klug, W.: **Die meteorologischen Parameter in der Sutton-Formel zur Berechnung der Maximalkonzentration am Erdboden,** [The meteorological parameters in the Sutton-formula for calculating the maximum-concentration at the earth's surface], p. 101–111

Schmidt, F. H.: **Dependence on stability of the parameters in Sutton's diffusion formula,** p. 112–122

Weidenhammer, F.: **Flatterschwingungen einflügeliger Windfahnen,** [Buffeting of single bladed weather vanes], p. 123–134

Canadian Journal of Physics, Ottawa, Vol. 38, No. 8, Aug. 1960

Wolfson, J. L. and Terentiuk, F.: **Concentration of particulate air-borne fission products at ground level in Canada during I.G.Y.,** p. 991–1010

Katzman, J. and Venkatesan, D.: **A world-wide study of the daily variation of the nucleonic component of cosmic rays,** p. 1011–1026

Weaver, J. T. and Skinner, R.: **A theory of ionospheric currents associated with aurorae, Pt. 1–2,** p. 1089–1113

Fejer, J. A.: **Scattering of radio waves by an ionized gas in thermal equilibrium,** p. 1114–1133

Collected Meteorological Papers, Tokyo, Vol. 9, No. 1, June 1959

Manabe, S.: **On the estimation of energy exchange between the Japan Sea and the atmosphere during winter based upon the energy budget of both the atmosphere and the sea.** Contribution No. 115

Yanai, M.: **On the changes in thermal and wind structure in a decaying typhoon.** Contribution No. 116

Isono, Kenji: **Microphysical processes in precipitation mechanism.** Contribution No. 117

Syono, S.; Miyakoda, K.; Manabe, S. et al.: **Broad-scale and small-scale analyses of a situation of heavy precipitation over Japan in the last period of Baiu season 1957.** Contribution No. 118

Miyakoda, K.: **The method of numerical time integration of vorticity equation involving frictional term.** Contribution No. 119

Komabayasi, M.: **Dissolved oxygen in rainwater and its relation to the raincloud structure, Pt. 1, Precipitation from September to March.** Contribution No. 120

Komabayasi, M.: **Dissolved oxygen in rain water and its relation to the raincloud structure, Pt. 2, Precipitation from April to September.** Contribution No. 121

Aihara, M.: **Stability properties of large-scale baroclinic disturbances in a vertically and horizontally variable zonal current.** Contribution No. 122

Komabayasi, M.: **The suppression of thundercloud occurrence by frequent volcanic eruptions, Pt. 2.** Contribution No. 123

Deutsche Hydrographische Zeitschrift, Hamburg, Vol. 12, No. 6, Dec. 1959

Gabler, Heinz: **Über die Grenzen der Genauigkeit bei Echolotungen in ozeanischen Seeräumen,** [Limits of accuracy of echo soundings in ocean regions], p. 229–243

Pierson, Willard J., Jr.: **Study of wave forecasting methods and of the height of a fully developed sea on the basis of some wave records obtained by the O.W.S. Weather Explorer during a storm at sea,** p. 244–259

Walden, Hans: **Bemerkungen zu einer von Djounkovski und Bojitch angegebenen Beziehung zur Berechnung des Seegangs aus den Windverhältnissen,** [Remarks on a relationship established by N. N. Djounkovski and P. K. Bojitch (1959) for computing sea waves from wind conditions], p. 259–262

Saint-Guily, Bernard: **Sur la solution du problème d'Ekman,** [Solution of the Ekman problem] p. 262–270

Vol. 13, No. 1, Feb. 1960

Tomczak, Gerhard: **Über die Genauigkeit der Sturmflutvorhersage für die deutsche Nordseeküste,** [Accuracy of storm surge forecasts for the German North Sea Coast], p. 1–13

Ichiye, Takashi and Olson, F. C. W.: **Über die neighbour diffusivity im Ozean,** ["Neighbor" diffusivity in the ocean], p. 13–23

Rogalla, Ernst-Helmuth: **Über die Aufnahme einer untermeerischen Kuppe zwischen Rockall und St. Kilda,** [Survey of a submarine peak between Rockall and St. Kilda], p. 24–27

Indian Journal of Meteorology and Geophysics, New Delhi, Vol. 11, No. 2, April 1960

Raman, P. K. and Krishnan, A.: **Runs of dry and wet spells during southwest monsoon and onset of monsoon along the west coast of India,** p. 105–116

Vohra, K. G.; Rangarajan, C. and Jain, M. C.: **Measurements on the ground deposition of fission products from nuclear test explosions,** p. 117–122

Vohra, K. G.; Rangarajan, C. and Ingle, N. A.: **Airborne fallout measurements in India,** p. 123–128

George, C. A. and Abbi, S. S.: **Thickness advection at the 500-mb surface in relation to very heavy rainfall,** p. 129–136
Saha, B. P.: **Microseismic evidence for the existence of cold fronts in association with Nor'westers,** p. 137–144
Srivastava, R. C.: **Drop size distribution in a complete "warmer" shower process,** p. 145–152
Dhar, O. N.: **The diurnal variation of rainfall at Barahkshetra and Kathmandu during monsoon months,** p. 153–156
Srivastava, R. C. and Kapoor, R. K.: **Drop size distribution and liquid water in a winter fog at Delhi,** p. 157–162
LaFond, E. C. and Moore, A. T.: **Short period variations in sea water temperatures,** p. 163–166
Nanda, J. N. and Blachandran, N. K.: **Sea-wave spectrum by echo-sounder,** p. 167–168
Gill, P. S.; Vir, Lekh; Yadav, R. S. and Khara, M. K.: **Cosmic ray increase associated with a small solar flare,** p. 169–170
Venugopal, V. R.: **Temperature of the F region of the ionosphere over Kodaikanal,** p. 171–175
Post-monsoon season (October–December 1959), p. 188–191
Solar, geomagnetic, ionospheric and ozone data, p. 192–201
Mooley, D. A. and Soundararajan, K.: **Severe thundersquall at Bangalore on February 2, 1959,** p. 202–203
Antarkar, V. N.: **A note on vertical visibility,** p. 204–205
Tandon, A. N.: **Seismographic recording of blasts at Bhakra,** p. 205–208
Saha, B. P.: **[Obituary of] Beno Gutenberg,** p. 214

Japan. Science Council. Ionosphere Research Committee, Report of Ionosphere and Space Research in Japan, Vol. 13, No. 3, 1959

Ichimiya, Torao; Takayama, Kazuo and Aono, Yuichiro: **Measurement of positive ion density in the ionosphere,** p. 155–176
Obayashi, Tatsuzo: **A possibility of the long distance HF propagation along the exospheric field-aligned ionizations,** p. 177–186
Miya, Kenichi; Sasaki, Tetsuo and Ishikawa, Masaru: **Angles of arrival of a VHF signal in ionospheric forward propagation,** p. 187–200
Obayashi, Tatsuzo: **Entry of high energy particles into the polar ionosphere,** p. 201–219

Journal of Atmospheric and Terrestrial Physics, London, Vol. 18, No. 2/3, June 1960

Duncan, R. A.: **The equatorial F-region of the ionosphere,** p. 89–100
Obayashi, Tatsuzo and Hakura, Yukio: **Enhanced ionization in the polar ionosphere associated with geomagnetic storms,** p. 101–122
Khastgir, S. R. and Singh, R. N.: **The size of the moving irregularities in the F-region and the spread angle of the radio waves scattered from them,** p. 123–126
Bandyopadhyay, P.: **Electron distribution in the F-layer of the ionosphere over Haringhata (Calcutta) on quiet and disturbed days,** p. 127–134
Fejer, J. A.: **Hydromagnetic wave propagation in the ionosphere,** p. 135–146
Taubenheim, J.: **Incoherency of pulse echoes and the measurement of ionospheric absorption,** p. 147–151
Lepechinsky, D. and Taieb, C.: **Sur la détermination des hauteurs réelles de l'ionisation dans les hautes latitudes,** [Determination of true height of ionization in high latitudes], p. 152–159
Akasofu, Syun-Ichi: **On the ionospheric heating by hydromagnetic waves connected with geomagnetic micropulsations,** p. 160–173
Greenhow, J. S.; Neufeld, E. L. and Watkins, C. D.: **The scattering of 36 Mc/s radio waves by weak auroral ionization,** p. 174–180
Minnis C. M. and Bazzard, G. H.: **The geographical distribution of ionization in the F2-layer,** p. 181–183
Stebbings, R. F.; Groves, G. V.; Boyd, R. L. F. and Bowen, P. J.: **Low-altitude testing of the rocket-grenade experiment for upper atmosphere temperatures and winds,** p. 184–191
Veldkamp, J. and van Sabben, D.: **On the current system of solar-flare effects,** p. 192–202
Greenhow, J. S. and Hall, J. E.: **Diurnal variations of density and scale height in the upper atmosphere,** p. 203–214
Robinson, B. J.: **Diurnal variation of the electron distribution in the ionospheric E-layer,** p. 215–233
Rishbeth, H. and Barron, D. W.: **Equilibrium electron distributions in the ionospheric F2-layer,** p. 234–252

Umlauft, G.: **Focusing of electromagnetic waves by E_s-clouds,** p. 253–255
Bailey, V. A.: **A unified theory of terrestrial and solar magnetization, the outer Van Allen belt and high energy primary cosmic rays,** p. 256–257
Marasigan, V.: **Geomagnetic and sunspot influences on spread-F in Baguio,** p. 257–258
Indices of geomagnetic activity of the Observatories Hartland (Ha), Eskdalemuir (Es) and Lerwick (Le) November 1959 to March 1960, p. 259–263

Vol. 18, No. 4, Aug. 1960

Dasgupta, P. and Vij, K. K.: **Statistical analysis of fading of a single down-coming wave,** p. 265–275
Wright, J. W.: **Some magnetoionic phenomena of the Arctic E-region,** p. 276–289
Bazzard, G. H.: **Short-term differences in the behaviour of two daily indices of solar activity during the IGY,** p. 290–296
Minnis, C. M. and Bazzard, G. H.: **A monthly ionospheric index of solar activity based on F2-layer ionization at eleven stations,** p. 297–305
Minnis, C. M. and Bazzard, G. H.: **A world-wide semi-annual cycle in the E-layer of the ionosphere,** p. 306–308
Megill, L. R.; Jamnick, P. M. and Cruz, J. E.: **Seasonal variations in the twilight enhancement of (OI) 5577,** p. 309–314
Rastogi, R. G.: **A synoptic study of the *F2*-region of the ionosphere in the Asian zone,** p. 315–331
Gadsden, M. and Loughnan, C. J.: **Observations of non-field-aligned auroral rays,** p. 332–335
Dalgarno, A. and Parkinson, D.: **Photoionization of atomic oxygen and atomic nitrogen,** p. 335–337
Haubert, A.: **À propos de la détermination de la hauteur vraie du maximum d'ionisation dans la méthode des dix points,** [Determination of the true height of maximum of ionization by the 10–point method,] p.337–339
Cilliers, W. A.: **Changes in the fading speed of low-frequency radio waves,** p.339–341
Noxon, J. F. and Jones, A. Vallance: **An auroral emission in the 2·0–2·2μ region,** p. 341–343
Mawdsley, J.: **Fading of satellite transmissions and ionospheric irregularities,** p. 344
Indices of geomagnetic activity of the observatories Hartland (Ha), Eskdalemuir (Es) and Lerwick (Le) April 1960, p. 346

Vol. 19, No. 1, Sept. 1960

Watkins, C. D.: **The height and geometry of auroral radio echoes,** p. 1–9
Akasofu, Syun-Ichi: **Large-scale auroral motions and polar magnetic disturbances, Pt. 1, A polar disturbance at about 1100 hours on Sept. 23, 1957,** p. 10–25
Jones, I. L.: **Further observations of radio stellar scintillation,** p. 26–36
Hepburn, F.: **Analysis of smooth type atmospheric waveforms,** p. 37–53
Chivers, H. J. A.: **Observed variations in the amplitude scintillations of the Cassiopeia (23N5A) radio source,** p. 54–64
Marasigan, V.: **Damping coefficient of vibrating electrons,** p. 65–67
Schmelovsky, K. H.: **The electron density distribution derived from whistler data and Faraday-fading observations,** p. 68–71

Journal of Geophysical Research, Wash., D. C., Vol. 65, No. 9, Sept. 1960 (incl. on p. 2563–2636, papers of the Symposium of the Exosphere and Upper F Region, May 4, 1960, held by National Research Council. U. S. National Committee of the International Scientific Radio Union)

Hines, C. O.: **Symposium on the Exosphere and Upper F Region, May 4, 1960: Summary of the Proceedings,** p. 2563–2569
Johnson, Francis S.: **The exosphere and upper *F* region,** p. 2571–2575
Singer, S. F.: **Structure of the earth's exosphere,** p. 2577–2580
Barrington, R. E. and Nishizaki, T.: **Whistler dispersion and exospheric hydrogen ions,** p. 2581–2582
Smith, R. L. and Helliwell, R. A.: **Electron densities to 5 earth radii deduced from nose whistlers,** p. 2583
Graves, Carl D.: **Radio propagation measurements using the Explorer VI satellite,** p. 2585–2587
Berning, Warren W.: **A sounding rocket measurement of electron densities to 1500 kilometers,** p. 2589–2594

Wright, J. W.: **Comment on models of the ionosphere above $h_{max}F_2'$,** p. 2595–2596
Nisbet, John S.: **Electron-density distribution in the upper ionosphere from rocket measurements,** p. 2597–2599
Ross, W. J.: **The determination of ionospheric electron content from satellite Doppler measurements, Pt. 1, Method of analysis,** p. 2601–2606
Ross, W. J.: **The determination of ionospheric electron content from satellite Doppler measurements, Pt. 2, Experimental results,** p. 2607–2615
Dyce, R. B.: **Faraday rotation observations of the electron content of the exosphere,** p. 2617–2618
Millman, George H.; Sanders, Armand E. and Mather, Robert A.: **Radar-lunar investigations at a low geomagnetic latitude,** p. 2619–2626
Van Zandt, T. E. and Bowles, K. L.: **Use of the incoherent scatter technique to obtain ionospheric temperatures,** p. 2627–2628
Pineo, V. C.; Kraft, L. G. and Briscoe, H. W.: **Some characteristics of ionospheric backscatter observed at 440 Mc/s,** p. 2629–2633
Fejer, J. A.: **Radio-wave scattering by an ionized gas in thermal equilibrium,** p. 2635–2636
Winckler, J. R. and Bhavsar, P. D.: **Low-energy solar cosmic rays and the geomagnetic storm of May 12, 1959.** p. 2637–2655
Anderson, K. A. and Enemark, D. C.: **Observations of solar cosmic rays near the North magnetic Pole,** p. 2657–2671
McCracken, K. G. and Palmeira, R. A. R.: **Comparison of solar cosmic rays injection including July 17, 1959, and May 4, 1960,** p. 2673–2683
Ehmert, A.; Erbe, H.; Pfotzer, G.; Anger, C. D. and Brown, R. R.: **Observations of solar flare radiation and modulation effects at balloon altitudes, July 1959,** p. 2685–2694
O'Brien, B. J. and Ludwig, George H.: **Development of multiple radiation zones on October 18, 1959,** p. 2695–2699
Kellogg, Paul J.: **Calculations of cosmic-ray trajectories near the equator,** p. 2701–2703
Kellogg, Paul J.: **Electrons of the Van Allen radiation,** p. 2705–2713
Dessler, A. J.; Francis, W. E. and Parker, E. N.: **Geomagnetic storm sudden-commencement rise times,** p. 2715–2719
Sugiura, Masahisa: **A note on harmonic analysis of geophysical data with special reference to the analysis of geomagnetic storms,** p. 2721–2725
McIlwain, Carl E.: **Direct measurement of particles producing visible auroras,** p. 2727–2747
Gustafsson, Georg; Egeland, Alv and Aarons, Jules: **Audio-frequency electromagnetic radiation in the auroral zone,** p. 2749–2758
O'Brien, B. J.; Van Allen, J. A.; Roach, F. E. and Gartlein, C. W.: **Correlation of an auroral arc and a subvisible monochromatic 6300 A arc with outer-zone radiation on November 28, 1959,** p. 2759–2766
Heisler, L. H. and Whitehead, J. D.: **F-region traveling disturbances and sporadic-E ionization,** p. 2767–2773
Jacchia, Luigi G.: **A variable atmospheric-density model from satellite accelerations,** p. 2775–2782
Musen, Peter: **On the motion of a satellite in an asymmetrical gravitational field,** p. 2783–2792
Keigler, J. E. and Krawitz, L.: **Weather radar observations from an earth satellite,** p. 2793–2808
Roden, Gunnar I.: **On the nonseasonal variations in sea level along the west coast of North America,** p. 2809–2826
Heiskanen, W. A.: **The latest achievements of physical geodesy,** p. 2827–2836
Corpacius, Alexander: **Hiran geodesy and photographic observations,** p. 2837–2838
Whitten, C. A.: **Horizontal movement in the earth's crust,** p. 2839–2844
Ceely, Frederick F., Jr.: **Simultaneous adjustment of angular and distance measurements,** p. 2845–2848
Ewing, John; Luskin, Bernard; Roberts, Archie and Hirshman, Julius: **Sub-bottom reflection measurements on the continental shelf, Bermuda Banks, West Indies Arc, and in the West Atlantic Basins,** p. 2849–2859
Ostapoff, Feodor: **On the mass transport through the Drake Passage,** p. 2861–2868
Mink, John F.: **Distribution pattern of rainfall in the leeward Koolau Mountains, Oahu, Hawaii,** p. 2869–2876
Gill, Harold E.: **Evaporation losses from small-orifice rain gages,** p. 2877–2881
Suzuki, Seitaro: **Percolation measurements based on heat flow through soil with special reference to paddy fields,** p. 2883–2885
Biggar, J. W. and Nielsen, D. R.: **Diffusion effects in miscible displacement occurring in saturated and unsaturated porous materials,** p. 2887–2895
Batzel, Roger E.: **Radioactivity associated with underground nuclear explosions,** p. 2897–2902

Broecker, Wallace S.; Gerard, Robert; Ewing, Maurice and Heezen, Bruce C.: **Natural radiocarbon in the Atlantic Ocean,** p. 2903–2931
Tilton, G. R.: **Volume diffusion as a mechanism for discordant lead ages,** p. 2933–2945
Signer, P. and Nier, A. O.: **The distribution of cosmic-ray-produced rare gases in iron meteorites,** p. 2947–2964
Mason, Brian: **The origin of meteorites,** p. 2965–2970
Crozier, W. D.: **Black, magnetic spherules in sediments,** p. 2971–2977
Serata, Shosei and Gloyna, Earnest F.: **Principles of structural stability of underground salt cavities,** p. 2979–2987
Lincoln, J. Virginia: **Geomagnetic and solar data,** p. 2989–2991
Bandeen, William R. and Manger, Warren P.: **Angular motion of the spin axis of the Tiros I meteorological satellite due to magnetic and gravitational torques,** p. 2992–2995
Johnson, C. Y.; Hoffman, J. H.; Young, J. M. and Holmes, J. C.: **A method for measuring temperature directly in the upper atmosphere with a rocket-borne magnetic mass spectrometer,** p. 2996–2997
Van Allen, James A. and Lin, Wei Ching: **Outer radiation belt and solar proton observations with Explorer VII during March-April 1960,** p. 2998–3003
Arnoldy, R. L.; Hoffman, R. A. and Winckler, J. R.: **Solar cosmic rays and soft radiation observed at 5,000,000 kilometers from earth,** p. 3004–3007
Malville, J. M.: **The effect of the initial phase of a magnetic storm upon the outer Van Allen belt,** p. 3008–3010
Trainor, J. H.; Shea, M. A. and Lockwood, J. A.: **Increase of the nucleonic intensity on May 4, 1960,** p. 3011–3012
Pohrte, T.; Warwick, C. and Macdonald, N.: **A search for geomagnetic singular days,** p. 3013–3015
Heirtzler, J. R. and Hirshman, J.: **Measurements of the geomagnetic field near Capetown,** p. 3016–3018
Baez, Albert V.: **A proposed X-ray telescope for the 1- to 100-A region,** p. 3019–3020
Rangarajan, R.: **[Reply to] M. A. Benson: A new approach to peak flow estimation,** p. 3021–3022
Hatherton, T.: **Electrical resistivity of frozen earth,** p. 3023–3024

Vol. 65, No. 10, Oct. 1960 [Including Collected papers on planetary and space sciences, edited by Gordon J. F. MacDonald, p. 3025–3116]

Stoenner, R. W.; Schaeffer, O. A. and Davis, R., Jr.: **Meteorites as space probes for testing the spatial constancy of cosmic radiation,** p. 3025–3034
Fireman, E. L. and DeFelice, J.: **Argon 37, argon 39, and tritium in meteorites and the spatial constancy of cosmic rays,** p. 3035–3041
Anders, Edward and Stevens, Charles M.: **Search for extinct lead 205 in meteorites,** p. 3043–3047
Johnson, Francis S.: **The gross character of the geomagnetic field in the solar wind,** p. 3049–3051
Bridge, H. S.; Dilworth, C.; Rossi, B.; Scherb, F. and Lyon, E. F.: **An instrument for the investigation of interplanetary plasma,** p. 3053–3055
Öpik, E. J.: **The atmosphere and haze of Mars,** p. 3057–3063
Öpik, E. J. and Singer, S. F.: **Escape of gases from the moon,** p. 3065–3070
Leadabrand, R. L.; Dyce, R. B.; Fredriksen, A.; Prensnell, R. I. and Schlobohm, J. C.: **Evidence that the moon is a rough scatterer at radio frequencies,** p. 3071–3078
Eshleman, V. R.; Gallagher, P. B. and Barthle, R. C.: **Radar methods of measuring the cislunar electron density,** p. 3079–3086
Brown, Walter E., Jr.: **A lunar and planetary echo theory,** p. 3087–3095
Press, Frank; Buwalda, Phyllis and Neugebauer, Marcia: **A lunar seismic experiment,** p. 3097–3105
Hess, Wilmot N.: **The radiation belt produced by neutrons leaking out of the atmosphere of the earth,** p. 3107–3115
Parker, E. N.: **Geomagnetic fluctuations and the form of the outer zone of the Van Allen radiation belt,** p. 3117–3130
Obayashi, Tatsuzo and Hakura, Yukio: **Solar corpuscular radiation and polar ionospheric disturbances,** p. 3131–3142
Obayashi, Tatsuzo and Hakura, Yukio: **Propagation of solar cosmic rays through interplanetary magnetic field,** p. 3143–3148
Schwachheim, Georges: **The solar daily variation of the cosmic radiation: world-wide neutron monitor observations during the International Geophysical Year,** p. 3149–3157

Parsons, N. R.: **Effects of short-term world-wide modulation of the primary cosmic radiation on observed daily intensity variations,** p. 3159–3161
Korff, S. A. and Haymes, R. C.: **High neutron and radiation intensities at balloon altitudes during auroral display,** p. 3163–3167
Vestine, E. H.: **Note on the direction of high auroral arcs,** p. 3169–3178
Freier, G. D.: **The earth's electric field during an eclipse of the sun,** p. 3179–3181
Hill, G. E.: **Ionospheric disturbances following a solar flare,** p. 3183–3207
Yeh, K. C. and Gonzalez, V. H.: **Note on the geometry of the earth magnetic field useful to Faraday effect experiments,** p. 3209–3214
Wright, J. W.: **A test of a procedure for easy estimation of representative monthly electron density profiles for the ionosphere,** p. 3215–3217
Renau, Jacques: **A study of observed spread F,** p. 3219–3240
Malik, Chester; Aarons, Jules and Poeverlein, Hermann: **Backscatter experiments during the total eclipse of October 2, 1959,** p. 3241–3247
Fenwick, Richard C. and Villard, Oswald G., Jr.: **Continuous recordings of the frequency variation of the WWV-20 signal after propagation over a 4000-km path,** p. 3249–3260
Wilcox, J. B. and Maple, Elwood: **Audio-frequency fluctuations in the geomagnetic field,** p. 3261–3271
Murray, Francis W.: **Dynamic stability in the stratosphere,** p. 3273–3305
Libby, W. F. and Palmer, C. E.: **Stratospheric mixing from radioactive fallout,** p. 3307–3317
Palmer, Clarence E. and Taylor, Ronald C.: **The vernal breakdown of the stratospheric cyclone over the South Pole,** p. 3319–3329
Langer, G. and Stockham, J.: **High-altitude tracking by chemical smokes,** p. 3331–3338
Gossard, Earl E.: **Spectra of atmospheric scalars,** p. 3339–3351
Buell, C. Eugene: **The structure of two-point wind correlations in the atmosphere,** p. 3353–3366
Wilkening, Marvin H. and Hand, John E.: **Radon flux at the earth-air interface,** p. 3367–3370
Fenn, Robert W.: **Measurements of the concentration and size distribution of particles in the Arctic air of Greenland,** p. 3371–3376
Wilson, Basil W.: **Note on surface wind stress over water at low and high wind speeds,** p. 3377–3382
Pollak, M. J.: **Wind set-up and shear-stress coefficient in Chesapeake Bay,** p. 3383–3389
Tanner, C. B. and Pelton, W. L.: **Potential evapotranspiration estimates by the approximate energy balance method of Penman,** p. 3391–3413
Webb, E. K.: **On estimating evaporation with fluctuating Bowen ratio,** p. 3415–3417
Rowe, P. P.: **An equation for estimating transmissibility and coefficient of storage from river-level fluctuations,** p. 3419–3424
Hantush, Mahdi S. and Jacob, C. E.: **Flow to an eccentric well in a leaky circular aquifer,** p. 3425–3431
Onwumechilli, C. Agodi: **Lunar daily variation of the magnetic declination at Ibadan, Nigeria,** p. 3433–3435
Gilbert, Freeman and Knopoff, Leon: **Seismic scattering from topographic irregularities,** p. 3437–3444
Pomeroy, Paul and Oliver, Jack: **Seismic waves from high-altitude nuclear explosions,** p. 3445–3457
Hunkins, Kenneth: **Seismic studies of sea ice,** p. 3459–3473
Phillips, O. M.: **The mean horizontal momentum and surface velocity of finite-amplitude random gravity waves,** p. 3473–3476
Brace, W. F.: **An extension of the Griffith theory of fracture to rocks,** p. 3477–3480
Woodside, W. and Messmer, J. H.: **Molecular effects in heat conduction through porous rocks,** p. 3481–3485
Lincoln, J. Virginia: **Selected geomagnetic and solar data,** p. 3486
Dessler, A. J.: [**Discussion of**] **R. L. Arnoldy; R. A. Hoffman and J. R. Winckler: Observations of the Van Allen radiation regions during August and September 1959, Pt. 1,** p. 3487–3490
Beard, David B. and Johnson, Francis S.: [**Comment on**] **P. J. Wyatt: Analysis of charge drag,** p. 3491–3492
Licht, A. L.: [**Comment on**] **P. J. Wyatt: The drag on a charged satellite,** p. 3493
Farley, T. A. and Rosen, A.: **Charged-particle variations in the outer Van Allen zone during a geomagnetic storm,** p. 3494–3496
Davis, T. Neil: **The morphology of the polar aurora,** p. 3497–3500
Mechtly, E. A. and Bowhill, S. A.: **Measured noise intensities on 512 kc/s frequency,** p. 3501
Anger, C. D. and Brown, R. R.: **Observations of the temporary presence of radioactive matter in the atmosphere,** p. 3502–3503
Freier, G. D.: **The electric field of a large dust,** p. 3504

Herzberg, Luise: **The possible importance of nitric oxide formation during polar-cap ionospheric absorption events,** p. 3505–3508
Riggs, H. C.: [Discussion of] **A. I. Sharp; A. E. Gibbs; W. J. Owen and B. Harris: Application of the multiple regression approach in evaluating parameters affecting water yields of river basins,** p. 3509–3511
Jastrow, R. and Bryant, R.: **Variations in the orbit of the echo satellite,** p. 3512–3513

Vol. 65, No. 11, Nov. 1960

Mantis, H. T. and Winckler, J. R.: **Balloon observation of artificial radioactivity at the base of stratosphere,** p. 3515–3519
Anderson, K. A. and Enemark, D. C.: **Balloon observations of X rays in the auroral zone, Pt. 2,** p. 3521–3538
Pomerantz, Martin A.; Potnis, Vasant R. and Sandström, Arne E.: **The cosmic-ray equator and the earth's magnetic field,** p. 3539–3543
Gall, Ruth: **The secular variation and the geomagnetic theory of cosmic radiation,** p. 3545–3558
Beard, David B.: **The interaction of the terrestrial magnetic field with the solar corpuscular radiation,** p. 3559–3568
Murcray, W. B. and Pope, J. H.: **Radiation from protons of auroral energy in the vicinity of the earth,** p. 3569–3574
Roach, F. E.; Moore, J. G.; Bruner, E. C., Jr.; Cronin, H. and Silverman, S. M.: **The height of maximum luminosity in an auroral arc,** p. 3575–3580
Maxwell, A.; Howard, W. E., III and Garmire, G.: **Some statistics of solar radio bursts at sunspot maximum,** p. 3581–3588
Duncan, R. A.: **The cause of magnetic storms and bays,** p. 3589–3592
Francis, W. E. and Karplus, Robert: **Hydromagnetic waves in the ionosphere,** p. 3593–3600
Nisbet, John S. and Bowhill, S. A.: **Electron densities in the F region of the ionosphere from rocket measurements, Pt. 1, Methods of analysis,** p. 3601–3607
Nisbet, John S. and Bowhill, S. A.: **Electron densities in the F region of the ionosphere from rocket measurements, Pt. 2, Results of analysis,** p. 3609–3614
Singleton, D. G.: **The geomorphology of spread *F*,** p. 3615–3624
Rumi, G. C.: **The D_1, D_2 layers and the absorption of radio waves,** p. 3625–3630
Renau, Jacques: **Scattering of electromagnetic waves from a nondegenerate ionized gas,** p. 3631–3640
Murcray, David G.; Murcray, Frank H.; Williams, Walter J. and Leslie, Frank E.: **Water vapor distribution above 90,000 feet,** p. 3641–3649
Fenn, Robert W. and Weickmann, Helmut K.: **Atmospheric net radiation flux during winter in the Thule area, Greenland,** p. 3651–3656
Tanner, C. B.; Businger, J. A. and Kuhn, P. M.: **The economical net radiometer,** p. 3657–3667
Kuhn, P. M. and Suomi, Verner E.: **Infrared radiometer soundings on a synoptic scale,** p. 3669–3677
Whipple, Elden C., Jr.: **An improved technique for obtaining atmospheric ion mobility distributions,** p. 3679–3684
Berkofsky, Louis: **Internal gravity-vorticity lee waves over mountains,** p. 3685–3691
Van Dorn, William G.: **A low-frequency microbarograph,** p. 3693–3698
Gerber, J. F. and Deckler, W. L.: **Estimates of Bowen's ratio by the heat budget measurements of a cornfield,** p. 3699–3702
Post, Austin S.: **The exceptional advances of the Muldrow, Black Rapids, and Susitna Glaciers,** p. 3703–3712
Hantush, Mahdi S.: **Modification of the theory of leaky aquifers,** p. 3713–3725
Stearns, Forest W. and Carlson, Charles A.: **Correlations between soil-moisture depletion, solar radiation, and other environmental factors,** p. 3727–3732
Grover, Ben L.; Ligon, James T. and Kirkham, Don: **Operational characteristics of the laterals near the edge of a tile drainage system,** p. 3733–3738
de Josselin de Jong, G.: **Singularity distributions for the analysis of multiple-fluid flow through porous media,** p. 3739–3758
Huff, F. A. and Changnon, S. A.: **Distribution of excessive rainfall amounts over an urban area,** p. 3759–3765
Hopkins, Charles D., Jr.: **A method of estimating basin temperatures in New England and New York,** p. 3767–3771
Rama: **Investigations of the radioisotopes Be^7, P^{32}, and S^{35} in rain water,** p. 3773–3776
Alldredge, L. R.: **A proposed automatic standard magnetic observatory,** p. 3777–3786
Onodera, Seibe: **The kernel function in the multiple-layer resistivity problem,** p. 3787–3794
Longman, I. M.: **A technique for the numerical solution of geophysical problems,** p. 3795–3800

Longman, I. M.: **The interpolation of earth-tide records,** p. 3801–3803
Dorman, James and Prentiss, David: **Particle amplitude profiles for Rayleigh waves on a heterogeneous earth,** p. 3805–3816
Schwind, Joseph J.; Berg, Joseph W., Jr. and Cook, Kenneth L.: **PS converted waves from large explosions,** p. 3817–3824
Lincoln, J. Virginia: **Selected geomagnetic and solar data,** p. 3825
Nelson, J. H.: **The gyromagnetic ratio of the proton,** p. 3826
Hansen, Richard T.: **Bright 21-centimeter solar regions and geomagnetic storms in 1952–1953,** p. 3827–3829
Egan, R. D. and Peterson, A. M.: **Auroral noise at HF,** p. 3830–3832
Mange, Philip W.: **The distribution of minor ions in electrostatic equilibrium in the high atmosphere,** p. 3833–3834
Matsushita, S.: **Seasonal and day-to-day changes of the central position of the S_q overhead current system,** p. 3835–3839
Brice, N. M.: **Traveling wave amplification of whistlers,** p. 3840–3842
Reynolds, J. H.: **I-Xe dating of meteorites,** p. 3843–3846
Hantush, Mahdi S. and Bittinger, Morton W.: [**Discussion of**] **J. N. Luthin and J. W. Holmes: An analysis of the flow of water in a shallow, linear aquifer, and of the approach to a new equilibrium after intake,** p. 3847–3849
Merriam, Robert A.: **A note on the interception loss equation,** p. 3850–3851
Chinnery, M. A.: **Some physical aspects of earthquake mechanism,** p. 3852 3854
Birch, Francis: **Elastic constants of rutile** [**A correction**] **R. K. Verma: Elasticity of some high-density crystals,** p. 3855–3856
Rigby, Malcolm: **Auxiliary Publications Program,** p. 3857

Journal of Meteorological Research, Tokyo, Vol. 11, No. 2, Feb. 1959

Kikuta, I. and Nagata, M.: **On the relation between typhoon and change of weather trend,** p. 81–88
Kinoshita, M.: **A synoptic study on the gustwindstorm in the east China Sea and the northern Kyūshū District on January 21, 1958,** p. 89–96
Saitō, S.: **On the wind velocity at the Gotō Straits,** p. 97–100
Hamada, Japan. Weather Station: **The characteristics of wind and rain at Iwami District (western part of Shimane Prefecture),** p. 101–119
Yajima, Y.: **On the mechanism of tipping-bucket rain gauge, Pt. 4,** p. 120–123
Tsuchiya, I.: **On the palaeoclimate and the change of climatic type: on the relations of palaeoclimate to the peculiar flora distributed in serpentine areas and other areas,** p. 124–130
Yamasaki, M.: **Observations on the total amount of ozone during the solar eclipse of April 19, 1958,** p. 131–134
Yamada, N.: **A study on the flood forecasting over the River Shirakawa in Kumamoto Prefecture, Pt. 2,** p. 135–138
Tsuchiya, S.: **Determination of precipitation gage network in the Sagae River Basin of Yamagata Prefecture,** p. 139–146
Shimonoseki, Japan. Local Meteorological Observatory: **On the salty wind damage and the salty wind in Kyūshū District and Yamaguchi Prefecture, Pt. 3,** p. 146–148
Nakada, Y.: **On the rising of sea level at the Niigata Port,** p. 149–152
Hanzawa, M.: [**Comments on**] **T. Sawada: Method of forecasting the first date of the appearance of drift-ice area along the Okhotsk sea-side coast of Hokkaidō and** [**Reply by**] **Sawada,** p. 153–154

Journal of Meteorology, Boston, Vol. 17, No. 4, Aug. 1960

McClain, E. Paul: **Thermal conditions in the Arctic stratosphere near 80W in January,** p. 383–389
Farlow, N. H.: **Atmospheric reactions of slurry droplet fallout,** p. 390–399
Businger, J. A. and Kuhn, P. M.: **On the observation of total and net atmospheric radiation,** p. 400–405
Birchfield, Gene E.: **Numerical prediction of hurricane movement with the use of a fine grid,** p. 406–414
Clark, Robert A.: **A study of convective precipitation as revealed by radar observation, Texas 1958–59,** p. 415–425
Koenig, L. Randall: **The chemical identification of silver-iodide ice nuclei: a laboratory and preliminary field study,** p. 426–434

Chiu, Wan-cheng: **The spectra of large-scale turbulent transfer of momentum and heat,** p. 435–441
Goyer, G. G.; McDonald, J. E.; Baer, F. and Braham, R. R., Jr.: **Effects of electric fields on water-droplet coalescence,** p. 442–445
Bryan, Kirk: **The instability of a two-layered system enclosed between horizontal, coaxially rotating plates,** p. 446–455
York, William C.; Shu, H. Hunter and Rouleau, Wilfred T.: **Remarks on the numerical integration of the equations of droplet growth,** p. 456–459
Mason, B. J.: **The evolution of droplet spectra in stratus cloud,** p. 459–462
Gringorten, Irving I. and Sissenwine, Norman: **Correlation coefficients and prediction accuracy,** p. 462–463
McDonald, James E.: **An aid to computation of terminal fall velocities of spheres,** p. 463–465
Mantis, Homer T.: **On a diurnal variation of stratospheric winds,** p. 465–468
Vonnegut, B.; Moore, C. B. and Harris, C. K.: **Stabilization of a high-voltage discharge by a vortex,** p. 468–471
Herman, Benjamin M. and Abraham, Farid F.: **A note on the two-stream theory of radiational transfer through clouds,** p. 471–473
Portig, Wilfried H.: [**Comment on**] **Richard Fay: Some variations in European climatic temperature and** [**Reply by**] **Fay,** p. 474
McDonald, James E.: **A note on the aerodynamic effects of internal circulations in small raindrops,** p. 474–475
Reed, Richard J.: [**Comments on**] **W. Schwerdtfeger and U. Radok: Hodograph analysis as applied to the occurrence of clear-air turbulence and** [**Replies by**] **Edwin K. Keitz; Schwerdtfeger and Radok,** p. 476–478

Kiev, Ukraine. Nauchno-Issledovatel'skiĭ Gidrometeorologicheskiĭ Institut, Trudy, No. 10, 1959

Dombrovskaia, O. I.: **Sinopticheskie usloviia sil'nogo vetra na Ukraine,** [Synoptic conditions for strong winds in the Ukraine], p. 3–14
Prokh, L. Z.: **Oslablenie summarnoĭ radiatsii oblakami,** [Attenuation of total radiation by clouds], p. 15–24
Vinokurov, N. E. and Okuneva, N. V.: **O tumanakh v raĭone Kieva,** [Fogs in the Kiev region], p. 25–34
Podgornaia, A. D. and Khorunzheĭ, O. I.: **Usloviia obrazovaniia tumanov v raĭone Khersona,** [Conditions for the formation of fogs in the Kherson region], p. 35–40
Gromokovskiĭ, S. A.: **Usloviia obrazovaniia nizkoĭ oblachnosti v raĭone Zaporozh'ia,** [Conditions for the formation of low cloudiness in the Zaporozhe region], p. 41–47
L'vova, N. S.: **Obrazovanie tumanov v raĭone Kirovograda,** [Fog formation in the Kirovograd region], p. 48–52
Miliutenko, O. V.: **Tumany v raĭone Zaporozh'ia,** [Fogs in the Zaporozhe region], p. 53–57
Lenov, M. P.: **Termobaricheskie polia i vertikal'nye toki iuzhnykh tsiklonakh,** [Thermobaric fields and vertical currents in southern cyclones], p. 58–69
Starov, D. K.: **Pole vetra na srednikh vysotakh troposfery nad Chernym morem,** [Wind fields at medium heights of the troposphere above the Black Sea], p. 70–74
Levdikova, T. V.: **Meteli na Ukraine v sviazi s vykhodom iuzhnykh tsiklonov,** [Snow storms in the Ukraine in connection with the departure of southern cyclones], p. 75–86
Pereiaslavskaia, P. M.: **Sinopticheskie usloviia zasushlivykh periodov v vostochnykh oblastiakh Ukrainy v tepluiu polovinu goda,** [Synoptic conditions for drought periods in eastern regions of the Ukraine during the warm seasons], p. 87–92
Faĭnergol'ts, I. N.: **Nekotorye rezul'taty rascheta znachitel'nykh osadkov po Khar'kovskoĭ oblasti pri vykhode iuzhnykh tsiklonov,** [Some results of calculations of heavy precipitation in Kharkov Oblast' during the departure of southern cyclones], p. 93–98

Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy, No. 100, 1960

Shifrin, K. S. and Raskin, V. F.: **K teorii indikatrisy Rokara,** [Theory of Rocard's index], p. 3–14
Makhotkin, L. G.: **Ekvivalent massy Bemporada,** [Mass equivalent of Bemporad], p. 15–16
Gutshabash, S. D.: **Rasseianie sveta v dvukhsloĭnoĭ atmosfere,** [Light scattering in a two-layered atmosphere], p. 17–19
Kagan, V. K.; Perel'man, A. Ia. and Riabova, E. P.: **Iarkost' bezoblachnogo neba v dvukhparametricheskoĭ modeli atmosfery,** [Brightness of a cloudless sky in a two-parameter model of the atmosphere], p. 20–24

Shifrin, K. S. and Novosel'tsev, E. P.: **Issledovanie nekotorogo klassa opredelennykh integralov, soderzhashchikh kvadrat Besselevoĭ funktsii pervogo poriadka,** [Investigation of a certain class of definite intervals, containing the square of first-order Bessel function], p. 25–36

Ter-Markariants, N. E.: **O srednikh dnevnykh velichinakh al'bedo moria,** [Mean diurnal values of the albedo of the sea], p. 37–40

Novosel'tsev, E. P.: **Sravnitel'nyĭ analiz uslovii vizirovaniia pri oblachnom i bezoblachnom nebe,** [Comparative analysis of conditions for sighting with cloudy and clear skies], p. 41–44

Poliakova, E. A.: **Issledovaniia meteorologicheskoĭ dal'nosti vidimosti v dozhdiakh,** [Investigation of meteorological visibility during rain], p. 45–52

Poliakova, E. A. and Tret'iakov, V. D.: **Issledovanie meteorologicheskoĭ dal'nosti vidimosti pri snegopadakh,** [Investigation of meteorological visibility during snowfall], p. 53–57

Zel'manovich, I. L.: **Mikrostruktura i prozrachnost' snegopadov,** [Microstructure and transparency of snowfall], p. 58–64

Piatovskaia, N. P.: **Spektral'naia izmenchivost' nazemnykh kontrastov v vidimoĭ i blizkoĭ infrakrasnoĭ oblasti spektra,** [Spectral variability of contrasts at the ground in the visible and near infrared portion of the spectrum], p. 65–73

Goryshin, V. I.: **Ustanovka dlia izmereniia registratsii prozrachnosti atmosfery,** [Installation for measuring and recording atmospheric transparency], p. 74–85

Gaveskiĭ, V. L.: **Issledovanie dlinnovolnovogo izlucheniia atmosfery,** [Investigation of long wave radiation of the atmosphere], p. 86–92

Brounshteĭn, A. M.: **Chernyĭ izluchatel' s bol'shim otverstiem,** [Black radiator with a large aperture], p. 93–104

Voĭtikova, T. D. and Goryshin, V. I.: **Elektronnyĭ reguliator temperatury,** [Electronic temperature regulator], p. 105–109

Krasil'shchikov, L. B. and Golikova, O. I.: **Fotometricheskaia ustanovka dlia izmereniia spektral'nykh koeffitsientov iarkosti,** [Photometric device for measuring the spectral coefficient of brightness], p. 110–114

Rabinovich, Iu. I.: **Samoletnaia apparatura dlia izmereniia spektral'nykh opticheskikh kharakteristik atmosfery i podstilaiushcheĭ poverkhnosti,** [Airplane apparatus for measuring the spectral optical characteristics of the atmosphere and the underlying surface], p. 115–123

Nikitinskaia, N. I.: **O primenenii interferentsionnykh svetofil'trov tipa interferometra Fabri-Pero dlia uproshchennykh spektral'nykh izmereniĭ priamoĭ solnechnoĭ radiatsii v ul'trafioletovoĭ oblasti spektra,** [Use of interference light filters of the Fabry-Perot interferometer type for simplifying spectral measurements of direct solar radiation in the ultraviolet region of the spectrum], p. 124–127

Krasil'shchikov, L. B.: **K voprosu o vizirovanii ob"ektivnymi priemnikami cherez zamutnennuiu atmosferu,** [Sighting with objectives through a turbid atmosphere], p. 128–130

Krasil'shchikov, L. B. and Tsarevskaia, A. A.: **Ustanovka dlia izmereniia indikatris otrazheniia v spektral'noĭ oblasti 0,6–2,5μ,** [Device for measuring the reflective index in the spectral region from 0.6–2.5μ], p. 131–132

Barteneva, O. D. and Boiarova, A. N.: **Iarkost' sumerechnogo i nochnogo neba,** [Brightness of twilight and of the night sky], p. 133–140

Barashkova, E. P.: **Dlinnovolnovyĭ balans podstilaiushcheĭ poverkhnosti po nabliudeniiam v Karadage,** [Long wave balance of the underlying surface according to observations in Karadag], p. 141–153

Barashkova, E. P.: **Zavisimost' dlinnovolnovoĭ radiatsii atmosfery ot meteorologicheskikh elementov,** [Dependence of long wave atmospheric radiation on meteorological elements], p. 154–163

Grishchenko, D. L.: **O nekotorykh oshibkakh morskikh sudovykh aktinometricheskikh nabliudenii,** [Certain errors in marine actinometric observations from ships], p. 164–172

Makhotkin, L. G.: **Prozrachnost' atmosfery v Arktike i Antarktike,** [Transparency of the atmosphere in the Arctic and Antarctic], p. 173–174

Guliaev, B. I.: **Uglovye kharakteristiki priborov s ploskimi fil'trami,** [Angular characteristics of instruments with plane filters], p. 175–192

Guliaev, B. I.: **Kompensiruiushchaia nasadka k radiometram s ploskimi fil'trami,** [Compensating attachment to radiometers with plane filters], p. 193–197

Meteorologické Zprávy, Prague, Vol. 13, No. 1, 1960

Gregor, A.: **K šedesátce profesora dr. Mikuláše Končka,** [70th anniversary of Professor Dr. Mikuláš Končeк], p. 1–2

Petrek, Jozef: **Denný chod teploty vzduchu na Skalnatom Plese r. 1944–1958,** [Diurnal air temperature variation at Skalnaté Pleso from 1944–1958], p. 2–8

Krečmer, Vladimir: **Příspěvek k poznání mesoklimatu polan,** [Mesoclimate of a clearing] p. 8–18

Stibral, Jiří: **Dílčí studie vlivu povětrnostních podmínek na ranost kukuřice,** [Certain problems on the effects of meteorological conditions on the ripening of maize], p. 18–20

Küchel, Štefan: **Bilancia žiarenia, jej meranie a niektoré výsledky,** [Radiation balance, its measurement, and certain results], p. 21–22

Alpat'ev, A. M.: **Jak působí ovzdušné srážky na vláhové a biologické poměry v půdě,** [Influence of precipitation on the biological characteristics and the moisture regime of soils], p. 23–24

Monthly Weather Review, Wash., D. C., Vol. 88, No. 6, June 1960

Schwerdtfeger, W.: **The seasonal variation of the strength of the southern circumpolar vortex,** p. 203–208

Reed, Richard J.: **On the practical use of graphical prediction methods,** p. 209–218

Williams, Philip, Jr.: **An experiment in the use of "perfect" prognostic charts,** p. 219–222

Benes, Norman S.: **Soil temperatures at Cape Hallett, Antarctica, 1958,** p. 223–227

Williams, Dansy T. and Woodside, Joel J.: **Unusually wide tornado path,** p. 227–228

Woffinden, Charles M.: **The weather and circulation of June 1960: a hot dry month in the Southwest,** p. 229–234

Moscow. Tsentral'naia Aerologicheskaia Observatoriia, Trudy, No. 28, 1960

Abramovich, K. G. and Khrgian, A. Kh.: **Issledovanie uslovií vozniknoveniia sloistoobraznoĭ oblachnosti nizhnego iarusa,** [Investigation of the conditions leading to the formation of low level stratiform clouds], p. 3–48

Nepovitova, A. F.: **Formy verkhneĭ poverkhnosti oblachnykh sloev i ikh sviaz' s vertikal'nym gradientom temperatury v oblakakh,** [Forms of the upper surface of cloud layers and their relation to the temperature lapse rate in the clouds], p. 49–57

Burkovskaia, S. N.: **O raspredelenii vodnosti v oblakakh teplogo fronta,** [Water content distribution in warm front clouds], p. 58–69

Moscow. Tsentral'nyĭ Institut Prognozov, Trudy, No. 84, 1959

Popov, E. G. and Parshin, V. N.: **Otsenka metodiki i opravdyvaemosti gidrologicheskikh prognozov,** [Verification of methods and accuracy of hydrological forecasts], p. 3–42

Kalinin, G. P. and Makarova, T. T.: **Prognoz vesennego polovod'ia,** [Forecasting spring floods], p. 43–52

Sapozhnikov, V. I.: **Ob ispol'zovanii krivykh dobeganiia vody dlia prognoza stoka,** [Use of runoff-time curves for forecasting discharge], p. 54–64

Balashova, I. V.: **Nekotorye itogi nabliudeniĭ zamerzaniia vodokhranilishch,** [Certain results of observations on the freezing of reservoirs], p. 65–87

Vinogradova, N. F.: **Opyt rascheta srokov ledostava na vodokhranilishchakh Volzhskoĭ im. V.I. Lenina i Stalingradskoĭ GES i vozmozhnost' prognoza ego,** [Attempt at calculating freeze-up dates for the water reservoirs of the Lenin Hydroelectric Power Station on the Volga River and the Stalingrad Hydroelectric Power Station, and forecasting possibilities], p. 88–98

Piotrovich, V. V.: **Metodika dolgosrochnogo prognoza srokov ochishcheniia oto l'da vodokhranilishch Stalingradskoĭ, Volzhskoĭ i Tsimliankoĭ GES,** [Method of long range forecasting the disappearance of ice from the reservoirs of the Stalingrad, Volga, and Tsimliansk hydroelectric power stations], p. 99–114

Savchenkova, E. I.: **Utochnenie metodiki dolgosrochnogo prognoza srokov poiavleniia l'da na nekotorykh rekakh Sibiri i Dal'nego Vostoka,** [Elaboration of the method of long range forecasting of dates of appearance of ice in certain Siberian and Far Eastern rivers], p. 115–122

No. 90, 1959

Ginzburg, B. M.: **Kratkiĭ obzor metodov dolgosrochnykh prognozov vskrytiia i zamerzaniia rek,** [Brief review of the techniques in long range forecasting of river ice formation and breakup], p. 3–24

Balashova, I. V.: **Ob uchete vliianiia vetra na zamerzanie vodokhranilishch pri kratkosrochnykh prognozakh,** [Calculating the effect of wind on the freezing of reservoirs in short range forecasting], p. 25–35

Rozova, A. P.: **K metodike dolgosrochnogo prognoza srokov poiavleniia plavuchego l'da na rr. Mologe, Sude, Sheksne,** [Techniques of long range forecasting of the time when floating ice appears on the Mologa, Suda and Sheksna rivers], p. 36–38

Abal'ian, T. S.: **O kratkosrochnom prognoze stoka r. Amu-Dar'i,** [Short range runoff forecasting for the Amu-Dar'ia River], p. 39–46

Barabash, A. Ia.: **Prognoz stoka r. Alazani za period vesennego polovod'ia,** [Runoff forecasting for the Alazani River during spring floods], p. 47–49

Lapshin, V. P.: **Dolgosrochnyĭ prognoz ob"ema i maksimal'nogo raskhoda vesennego polovod'ia rek Zavolzh'ia,** [Long range forecasting of the volume and maximum discharge of rivers in the Trans-Volga region during spring floods], p. 50–65

Chernoivanenko, I. M.: **Metodika prognoza vodnosti r. Dona s bol'shoĭ zablagovremennost'iu,** [Techniques of long range water volume forecasting for the Don River], p. 66–73

No. 94, 1959

Kravchenko, N. A.: **Iz opyta obsluzhivaniia Dubossarskoĭ GES gidrologicheskimi prognozami,** [Experience gained in providing the Dubossar hydroelectric power plant with hydrological forecasts], p. 3–8

Salazanov, V. V.: **Ob uchete poter' talogo stoka na infil'tratsiiu v period vesennego polovod'ia,** [Calculation of the meltwater loss on infiltration during spring floods], p. 9–14

Lebedeva, N. D.: **Raschet snegotaianiia i metod kratkosrochnogo prognoza daty nastupleniia maksimal'nogo urovnia polovod'ia na r. Kame,** [Calculation of snow melt and a method of short range forecasting the date of the occurrence of the peak flood on the Kama River], p. 15–33

Rozova, A. P.: **Metodika dolgosrochnogo prognoza stoka i maksimal'nogo raskhoda polovod'ia na rekakh basseĭna Verkhneĭ Volgi,** [Method of long range forecasting runoff and maximum flood discharge of rivers in the Upper Volga Basin], p. 34–36

Kalinin, G. P. and Makarova, T. T.: **Issledovanie nekotorykh voprosov stoka vesennego polovod'ia,** [Investigation of certain problems of spring flood discharge], p. 37–47

Rakhmanov, V. V.: **Zavisimost' kolichestva osadkov ot lesistosti ravninnoĭ mestnosti Evropeĭskoĭ territorii SSSR,** [Dependence of the amount of precipitation on the wooded area in the plains of the European S.S.R.], p. 48–66

Nezhikhovskiĭ, R. A.: **O veroiatnostnoĭ forme gidrologicheskogo prognoza,** [Probable form of hydrological forecasts], p. 67–70

Mashukov, P. M.: **Ob otsenke gidrologicheskikh prognozov,** [Evaluation of hydrological forecasts], p. 71–78

Nechaeva, N. S.: **Naibolee rasprostranennye v SSHA metody rascheta transformatsii voln pavodkov pri peremeshchenii po rechnomu ruslu,** [Methods most widely used in the U. S. for calculating the transformation of flood waves during their movement along a river bed], p. 79–92

Dygalo, V. S.: **K voprosu o tochnosti izmereniia osadkov (po materialam nabliudenii stokovoĭ stantsii B. Sareevo),** [Accuracy of precipitation measurements, according to observations at the B. Sareevo gage station], p. 92–99

Planetary and Space Science, N. Y., Vol. 1, No. 4, Sept. 1959

Ellis, G. R.: **Low frequency electromagnetic radiation associated with magnetic disturbances,** p. 253–258

Champion, K. W. and Minzner, R. A.: **Atmospheric densities from satellites and rocket observation,** p. 259–264

Coulson, K. L.: **Characteristics of the radiation emerging from the top of a Rayleigh atmosphere, Pt. 1, Intensity and polarization,** p. 265–276

Vestine, E. H. and Sibley, W. L.: **Lines of force of the geomagnetic field in space,** p. 285–290

Marmo, F. F.; Pressman, J. and Aschenbrand, L. M.: **Artificial electron clouds, Pt. 2, General considerations,** p. 291–305

Cole, K. D.: **Electro-hydromagnetic waves in a fully ionized gas, Pt. 1,** p. 319–324

Maxwell, A.; Thompson, A. R. and Garmire, G.: **The association of solar radio bursts with auroral streams,** p. 325–332

Groth, W. E. and Schierholz, H.: **The photolysis of nitrous oxide in the far ultraviolet,** p. 333–342

Rosen, A.; Coleman, P. J., Jr. and Sonett, C. P.: **Ionizing radiation detected by Pioneer II,** p. 343–346

Polarforschung, Kiel, Ser. 4, Vol. 27, No. 1/2, 1957. Publ. Aug. 1, 1959

Tiedemann, K. H.: **Das Internationale Geophysikalische Jahr in den Polargebieten,** [The International Geophysical Year in the polar regions], p. 41–43

Warnecke, G.: **Über die tiefsten in der Atmosphäre gemessenen Temperaturwerte,** [On the lowest recorded value of atmospheric temperature], p. 46–47

Kosack, H. P.: **Japanische und argentinische Beiträge zur Landeskunde der Antarktis,** [Contribution of Japan and Argentine to Antarctic geophysics], p. 47–50

Warnecke, G.: **Eine fortlaufende Veröffentlichung aktueller Stratosphärenkarten für die ganze Nordhemisphäre,** [Continuing publication of current stratospheric charts for the entire N. Hemisphere], p. 50–51

Przegląd Geofizyczny, Warsaw, Vol. 4, No. 2, 1959

Kosiba, Aleksander and Zych, Stanislaw: **[Biographical sketch of] Henryk Arctowski [July 15, 1871–Feb. 21, 1958],** p. 83–90

Wirkus, Feliks: **Uwagi o graficznych metodach prognoz wysokości powierzchni izobarycznych,** [On the graphical methods of forecasting the height of isobaric surfaces], p. 91–105

Paszyński, Janusz: **Wstępne wyniki badania przezroczystości atmosfery w Bydgoszczy,** [Preliminary results of a study of atmospheric transparency at Bydgoszczy], p. 107–120

Lambor, Julian: **O danych meteorologicznych potrzebnych hydrologom,** [On meteorological data needed by hydrologists], p. 121–126

Mikulski, Zdzisław: **Wystepowanie niżówek na Wiśle i Odrze,** [Occurrence of low water states of the Wisła and Odra rivers], p. 127–136

Dziewulski, W.: **[Obituary of] Mikołaj Taranowski,** p. 137–139

[Obituary of] Artur Born, p. 139–140

Warzechowa, K.: **[Obituary of] Irena Bóbr-Modrakowa,** p. 141

Maksimow, N.: **Limnigraf dzwiękowy "Sareg,"** [Signaling SAREG limnigraph], p. 143–144

Parczewski, W.: **Międzynarodowa Współpraca Geofizyczna 1959 roku,** [International Geophysical Cooperation, 1959], p. 144–145

Chomicz, K.: **Druga Konferencja Meteorologiczno-Klimatologiczna Komisji Współpracy Polsko-Czechosłowackiej w regionie Tatr,** [Second meteorological and climatological conference of the Commission for Polish-Czechoslovak cooperation in the Tatra Region], p. 145–147

Zakrent, S.: **Konferencja poświecona aktynometrii i optyce atmosfery w Leningradzie,** [Conference on actinometry and atmospheric optics at Leningrad], p. 148–150

XII Zebranie Ogólne Międzynarodowej Unii Geodezyjno-Geofizycznej w 1960 roku w Helsinkach, [Twelfth general assembly of IUGG in 1960 in Helsinki], p. 150–152

Tyczka, S.: **Piśmiennictwo polskie z bioklimatologii człowieka w latach 1930–1958,** [Bibliography of Polish literature on human bioclimatology, 1930–1958], p. 153–161

Różanski, S. and Paszyński, J.: **Piśmiennictwo polskie z bioklimatologii urbanistycznej (1930–1955),** [Bibliography of Polish literature on urban bioclimatology (1930 1955)], p. 161–162

Sprawozdanie z działalności polskiego Towarzystwa Meteorologicznego i Hydrologicznego za rok 1958 (skrót), [Report on activities of the Polish Meteorological and Hydrological Society in 1958], p. 163–165

Soviet Astronomy AJ, New York, Vol. 3, No. 1, Jan./Feb. 1959. (Transl. of original Russian journal, **Astronomicheskiĭ Zhurnal,** Moscow, Vol. 36, No. 1, Jan./Feb. 1959)

Mustel', E. R. and Mitropol'skaia, O. N.: **The velocity spectrum of corpuscles in solar corpuscular streams,** p. 5–21

Syrovatskiĭ, S. I.: **The distribution of relativistic electrons in the galaxy and the spectrum of synchrotron radio emission,** p. 22–38

Kuz'min, A. D. and Udal'stov, V. A.: **An investigation of the polarization of the 10-cm radiation of the crab nebula,** p. 39–45

Agekian, T. A.: **The probability of a stellar approach with a given change of the absolute velocity,** p. 46–58

Khokhlova, V. L.: **A spectrophotometric investigation of the H and K Ca^+ lines in the chromosphere and solar faculae,** p. 59–68

Kolpakov, P. E.: **On the generation of corpuscular streams by the magnetic fields of sunspots,** p. 69–75

Rublev, S. V.: **On the possibility of outflow of matter from supergiant stars of late spectral classes,** p. 76–87

Idlis, G. M.: **The symmetry of stationary axially symmetric stellar systems relative to the equatorial plane,** p. 88–91

Biutner, E. K.: **Gas dissipation from planetary atmospheres, Pt. 2, The total velocity of gas dissipation from a planetary atmosphere: the problem of terrestrial helium,** p. 92–102

Barkhatova, K. A.: **An atlas of color-luminosity diagrams for open star clusters,** p. 103–107

Sharov, A. S.: **On the nature of the relation between stellar color excesses and the brightness of the Milky Way,** p. 108–114

Tel'fel', V. G.: **On normal color indexes and the color-brightness relation for portions of the lunar surface,** p. 115–121

Artiukhina, N. M. and Karimova, D. K.: **The meridian proper motions of 161 stars in the region of the belt of Orion,** p. 123–130

Bobrov, M. S.: **Derivation of the theoretical phase function of the brightness of Saturn's rings and its comparison with observations,** p. 131–135

Fialko, E. I.: **A new method for determining the radiant of a meteor stream, using an antenna of low directivity,** p. 136–138

Anfimov, N. A.: **Some regularities in the motion of meteoric bodies in the atmosphere,** p. 139–142

Dudnik, B. S.; Kashcheev, B. L.; Lagutin, M. F. and Lysenko, I. A.: **The velocity of meteors of the Geminid shower,** p. 143–146

Drozdov, S. V.: **A catalog of declinations of 197 stars of the Poltava zenith program, selected from observations made on the zenith telescope from 1944 to 1947,** p. 147–153

Duboshin, G. N.: **On one particular case of the problem of the translational-rotational motion of two bodies,** p. 154–165

Popov, N. A.: **On the semiannual and semimonthly nutational terms in the variations of the latitude of Poltava,** p. 166–172

Grushinskiĭ, N. P. and Epishin, I. A.: **Special quartz clocks for gravimetric measurements: their use on the diesel-engine ship "OB" during the Antarctic Expedition,** p. 173–179

Parenago, P. P.: **On the observational difference between the expressions for the galactic potential according to Kuzmin and to Parenago,** p. 180–182

Parenago, P. P.: **On the function A(m, C) giving the distribution of stars according to stellar magnitudes and color indices,** p. 185–187

Manova, G. A.: **New emission stars in the constellation Orion,** p. 188–192

Gershman, B. N.: **On the problem of the propagation of magnetohydrodynamic waves in cosmic conditions,** p. 193–195

Bagariatskiĭ, B. A. and Gal'perin, Iu. I.: **On hydrogen line profiles in the spectra of aurorae,** p. 196–197

Popov, N. A.: **O polugodovom i polumesiachnom chlenakh nutatsii v kolebaniiakh shiroty Poltavy,** [On the semiannual and semimonthly nutational terms in the variations of the latitude of Poltava], p. 164–171

Grushinskiĭ, N. P. and Epishin, I. A.: **Spetsial'nye kvartsevye chasy dlia gravimetricheskikh izmereniĭ, ikh primenenie v morskoĭ ekspeditsii 1956–1957 gg. na dizel'-elektrokhode "Ob"),** [Special quartz clocks for gravimetric measurements: their use on the diesel-electric ship "Ob" during the Antarctic Expedition], p. 172–178

Parenago, P. P.: **O nabliudatel'nom razlichii vyrazheniĭ galakticheskogo potentsiala po Kuzminu i po Parenago,** [On the observational difference between the expressions for the galactic potential according to Kuzmin and to Parenago], p. 179–182

Parenago, P. P.: **O funktsii A (m,C), daiushcheĭ raspredelenie zvezd po zvezdnym velichinam i pokazateliam tsveta,** [Function A (m,C) giving the distribution of stars according to stellar magnitudes and color indices], p. 182–187

Manova, G. A.: **Novye emissionnye zvezdy v sozvezdii Oriona,** [New emission stars in the constellation Orion], p. 187–190

Gershman, B. N.: **K voprosu o rasprostranenii magnitogidrodinamicheskikh voln v kosmicheskikh usloviiakh,** [Problem of the propagation of magnetohydrodynamic waves under cosmic conditions], p. 190–192

Bagariatskiĭ, B. A. and Gal'perin, Iu. I.: **O profiliakh vodorodnykh liniĭ v spektrakh poliarnykh siianiĭ,** [Hydrogen line profiles in the spectra of auroras], p. 192–193

Vol. 3, No. 2, March/April 1959 [Transl. of original Russian journal, **Astronomicheskiĭ Zhurnal,** Moscow, Vol. 36, No. 2, March/April 1959]

Fesenkov, V. G.: **On the optical state of the atmosphere illuminated by twilight,** p. 207–213

Severnyĭ, A. B.: **Fine structure of the magnetic field and depolarization of radiation in sunspots,** p. 214–220

Mustel', E. R.: **Statistical effects due to the connection between flocculi and geomagnetic disturbances,** p. 221–227
Mitropol'skaia, O. N.: **Some results of statistical treatment of geomagnetic disturbances of the declining branch of solar activity,** p. 228–234
Ginzburg, V. L. and Zhelezniakov, V. V.: **On the propagation of electromagnetic waves in the solar corona, taking into account the influence of the magnetic field,** p. 235–246
Baturova, G. S.; Pominov, I. S.; Stolov, A. L. and Smirnova, N. N.: **Spectroscopic observations of the solar corona during the total solar eclipse of June 30, 1954,** p. 247–253
Cherednichenko, V. I.: **The dissociation and ionization of cometary molecules in the photon and corpuscular field of solar radiation,** p. 254–262
Pikel'ner, S. B.; Shklovskiĭ, I. S. and Ivanov-Kholodnyĭ, G. S.: **On possible mechanisms of emission of discrete galactic objects in the spectral region 1225–1350 A,** p. 263–266
Zhevakin, S. A.: **On the calculation of nonadiabatic stellar pulsations by use of a discrete model,** p. 267–279
Agekian, T. A.: **The velocity distribution function and the rate of dissipation in systems of gravitating bodies,** p. 280–290
Kholopov, P. N.: **A revised list of T-associations and their members,** p. 291–300
Pskovskiĭ, Iu. P.: **A comparison of the distance scales for planetary nebulae with the help of the galactic rotation effect,** p. 301–305
Fialko, E. I.: **Radar observations of the Perseids during 1957,** p. 306–309
Sytinskaia, N. N.: **New data on the meteoric-slag theory of the formation of the outer layer of the lunar surface,** p. 310–314
Lipskiĭ, Iu. N.: **Distinctive features of the spectrophotometric studies of the lunar surface,** p. 315–319
Divari, N. B. and Asaad, A. S.: **On the emission of the green line of the night sky in zodiacal light,** p. 320–325
Katasev, L. A.: **The determination of the height of the homogeneous atmosphere from photographic observations of meteors,** p. 326–331
Kulikov, D. K.: **A method for correcting planetary positions for aberration,** p. 332–340
Kiselev, A. A.: **An interpolation method for the photographic determination of the position of a celestial object,** p. 341–352
Grebenikov, E. A.: **The perturbed motion of Saturn's eighth satellite Iapetus,** p. 353–361
Kaplaň, S. A. and Klimishin, I. A.: **On the correlation between the observed difference in the degree of interstellar polarization and the angular distance of the corresponding points on the celestial sphere,** p. 362
Kononovich, E. V.: **A nomogram for determining the parameters of profiles of emission lines with self-absorption,** p. 363–365
Starikova, G. A.: **Relative positions and magnitudes of the components of trapezium-type stars,** p. 366–367
Sitnik, G. P.: **Some characteristics of the SI-16 ribbon lamp as a standard of radiant energy,** p. 368–370
Nemirova, E. K.: **Some results of preliminary observations of resonance scattering of radio waves by meteor trails,** p. 371–373

Vol. 3, No. 3, Dec. 1959 [Transl. of original Russian journal, **Astronomicheskiĭ Zhurnal,** Moscow, Vol. 36, No. 3, May/June 1959)

Mel'nikov, O. A.: **The intensity of quadrupole multiplet lines of ionized iron,** p. 381–388
Zhevakin, S. A.: **On the pulsational theory of stellar variability, Pt. 5, Multilayer spherical discrete model,** p. 389–403
Kaplan, S. A. and Klimishin, I. A.: **Shock waves in stellar envelopes,** p. 404–414
Getmantsev, G. G.: **The determination of the mean dimensions of magnetized clouds of interstellar gas by radioastronomical methods,** p. 415–418
Pisareva, V. V.: **Fluctuations in the intensity of radio emissions scattered by coronal irregularities,** p. 419–424
Kholopov, P. N.: **The system of T-associations,** p. 425–433
Dolidze, M. V. and Arakelian, M. A.: **The T-association near ρ Ophiuchi,** p. 434–438
Pskovskiĭ, Iu. P.: **An investigation of the parameters of galactic rotation based on radial velocities of Cepheids and radio observations of the emission lines of interstellar hydrogen,** p. 439–446
Efimov, Iu. S.: **Photometry of the planetary nebula NGC 7293 (Helix),** p. 447–450
Dokuchaeva, O. D.: **Determination of the mass of the Orion nebula from photographs taken in red light,** p. 451–457

Aleshin, V. I.: **On the asymmetry of the radial velocity curve of Cepheids,** p. 458–465
Nikol'skiĭ, G. M.: **The coronal emission line λ5694,** p. 466–469
Nemirova, E. K.: **The role of resonance effects in the measurement of meteor velocities,** p. 470–474
Makovetskiĭ, P. V.: **The antiradiant of a meteor stream,** p. 475–478
Fialko, E. I.: **An approximate estimation of the probability of meteoric ionization,** p. 479–483
Barabashov, N. P.; Ezerskiĭ, V. I. and Fedorets, V. A.: **Color contrasts of the lunar surface,** p. 484–489
Vsekhsviatskiĭ, S. K.: **On the nature of "synchronic" formations in comets' tails,** p. 490–498
Shteins, K. A.: **The distribution of the Jovian group of comets, Pt. 2, The spatial problem,** p. 499–509
Iarov-Iarovoĭ, M. S. and Grebenikov, E. A.: **The computation of exact and approximate ephemerides of artificial earth satellites,** p. 510–519
Omarov, S. Z.: **The calculation of the combined effect of differential refraction and aberration,** p. 520–523
Pariiskiĭ, N. N. and Gindilis, L. M.: **New luminophores of constant brightness for spectrophotometry of faint objects. Energy distribution in the spectrum of the luminophores,** p. 524–528
Vitkevich, V. V. and Panovkin, B. N.: **On the structure of the nonuniformities of the solar supercorona,** p. 529–530
Porfir'ev, V. V.: **The law of rotation of a polytropic gas sphere,** p. 531–532
Zhukova, L. N.: **Chromatic scintillations,** p. 533–534
Kliakotko, M. A.: **The significance of the correlation coefficients of the velocities of latitude displacement of nonrecurrent sunspots for several years,** p. 534–536

Vol. 3, No. 4, Jan./Feb. 1960 [Transl. of original Russian journal, **Astronomicheskiĭ Zhurnal,** Moscow, Vol. 36, No. 4, July/Aug. 1959]

Fesenkov, V. G.: **On the investigation of atmospheric ozone by photometry of lunar eclipses,** p. 554–562
Sobolev, V. V.: **On the theory of radiation diffusion in stellar atmospheres,** p. 563–568
Shklovskiĭ, I. S.: **Corpuscular emission from early-type stars as a possible cause of emission from nebulae in the region 1225–1350 A,** p. 569–574
Mel'nikov, O. A.; Kuprevich, N. F. and Zhukova, L. N.: **Absolute spectrophotometric gradients for stars derived by reference to a "star" with a high color temperature,** p. 575–577
Ivanov-Kholodnyi, G. S.: **The electron density in solar prominences,** p. 578–587
Bobrov, M. S.: **The estimation of some parameters describing the nonuniformity of solar corpuscular streams,** p. 588–600
Mitropol'skaia, O. N.: **The correlation between the geomagnetic disturbances of 1950 and calcium plages,** p. 601–605
Dvoriashin, A. S.: **On the statistics of geomagnetic disturbances and active solar regions,** p. 606–608
Vitkevich, V. V.: **On the degree of homogeneity of the quiet ionosphere,** p. 608–611
Fialko, E. I.: **Mean hourly rate of meteors recorded by radar,** p. 612–614
Kashcheev, B. L. and Lebedinets, V. N.: **On the structure of the Geminid meteor shower,** p. 615–625
Vitkevich, V. V.; Gorelova, M. V. and Lozinskaia, T. A.: **The spectrum of peaks in solar radio emission,** p. 626–627
Zelinskaia, M. R.; Troitskiĭ, V. S. and Fedoseev, L. I.: **Lunar radio emissions at 1.63 cm wavelength,** p. 628–632
Martinov, D. Ia.: **The visual stellar magnitude of the sun, the moon, and the lux,** p. 633–644
Pskovskiĭ, Iu. P.: **The zero-point of the period-luminosity relation for Cepheids, found from an analysis of radial velocities according to Oort's formula,** p. 645–651
Idlis, G. M. and Nikol'skiĭ, G. M.: **The diffuse medium in globular clusters,** p. 652–659
Alksne, Z.; Daube, I. and Reizin', L.: **Improvement of the proper motions of stars,** p. 660–664
Kirillova, T. S.: **Photographic magnitudes of faint stars in the region of σ and ζ Orionis,** p. 665–671
Artiukhina, N. M.: **On a method for improving the proper motions of stars given in the GC,** p. 672–675
Kurochkin, N. E.: **On the dependence between the amplitude of variation in brightness and the amplitude of variation in radial velocities for pulsating variable stars,** p. 676–679
Idlis, G. M.: **Dynamics of the Magellanic Clouds and their origin from the galaxy as a probable result of a collision of the galaxy with NGC55,** p. 680–697

Nazarchuk, G. K.: **Accelerations in the tail of the comet 1956h (Arend-Roland)**, p. 698–701
Duboshin, G. N.: **On the stability of regular motions of artificial celestial bodies**, p. 702–712
Leikin, A. Ia.: **A maser time and frequency standard**, p. 713–716
Apushkinskiĭ, G. P. and Pariiskiĭ, Iu. N.: **Observations of the Crab nebula with the large radio telescope of the Pulkovo Observatory**, p. 717–718
Uranova, T. A.: **Absorption of light in a region in the rift of the Milky Way**, p. 718–720
Romanchuk, P. R. and Kudinova, T. P.: **On the East-West asymmetry of spot-formation activity of the sun**, p. 721–723

Vol. 3, No. 5, March/April 1960 [Transl. of original Russian journal, **Astronomicheskiĭ Zhurnal**, Moscow, Vol. 36, No. 5, Sept./Oct. 1959)

Sobolev, V. V.: **Some remarks on the spectra of Be type stars**, p. 735–743
Mustel', E. R. and Boiarchuk, M. E.: **The chemical composition of N Her 1934**, p. 744–747
Boiarchuk, A. A.: **A quantitative analysis of the chemical composition of the atmosphere of the bright component of β Lyrae**, p. 748–758
Nikitin, A. A.: **The investigation of the lines of heavy elements in the spectra of planetary nebulae**, p. 759–764
Pikel'ner, S. B. and Gershberg, R. E.: **On the possibility of the formation of filamentary structures by twisting**, p. 765–772
Masevich, A. G.: **On the later stages of stellar evolution**, p. 773–777
Kaplan, S. A.: **On cosmic force-free fields**, p. 778–783
Sharov, A. S.: **The spatial structure of several clusters of galaxies**, p. 784–792
Kurochkin, N. E.: **The period-amplitude diagram for RR Lyr type stars**, p. 793–801
Kupo, I. D.: **The spectrophotometric study of χ Ophiuchi**, p. 802–807
Artiukhina, N. M.: **Absolute proper motions of 21 variables of the RW Aur type**, p. 808–812
Kardashev, N. S.: **On the possibility of detection of allowed lines of atomic hydrogen in the radio-frequency spectrum**, p. 813–820
Bronshten, V. A.: **The structure of the far outer corona of June 19, 1936**, p. 821–826
Barabashov, N. P. and Chekirda, A. T.: **A study of the rocks most closely resembling the surface constituents of the moon**, p. 827–831
Divari, N. B. and Asaad, A. S.: **Photoelectric observations of the zodiacal light in Egypt**, p. 832–838
Bobrov, M. S.: **On the absolute brightness of the B-ring of Saturn**, p. 839–841
Fialko, E. I.: **Distribution of meteor radio echoes by duration, Pt. I, Reflection from stable trails**, p. 842–848
Pil'nik, G. P.: **Determination of the position of the collimation line**, p. 849–856
Bogorodskiĭ, A. F.: **Relativistic effects in the motion of an artificial earth satellite**, p. 857–862
Kondurar', V. T.: **Particular solutions of the general problem of the translational-rotational motion of a spheroid attracted by a sphere**, p. 863–875
Gershberg, R. E. and Pronik, V. I.: **On the theory of Stromgren's zones**, p. 876–878
Borisoglebskiĭ, L. A.: **On the identification of coronal lines**, p. 879–880
Lotova, N.: **On estimating the angle of scattering of radio waves**, p. 881–883
Matiagin, V. S.: **An empirical formula for the characteristic curve of stellar focal images**, p. 883–886
Severnyĭ, A. B.: **On the appearance of cosmic rays in the pinch effect in solar flares**, p. 887

Vol. 3, No. 6, May/June 1960 [Transl. of original Russian journal, **Astronomicheskiĭ Zhurnal**, Moscow, Vol. 36, No. 6, Nov./Dec. 1959)

de Vaucouleurs, Gerard: **The local supercluster of galaxies**, p. 897–912
Zhevakin, S. A.: **The pulsational theory of stellar variability, Pt. 6, A unified interpretation of various types of variability**, p. 913–922
Artiukhina, N. M. and Kholopov, P. N.: **Distribution of stars in the region of the double stellar cluster h and χ Persei**, p. 923–936
Kazachevskaia, T. V. and Ivanov-Kholodniĭ, G. S.: **Continuous solar emission in the X-ray region**, p. 937–942
Bobrov, M. S.: **A study of solar corpuscular streams based on world-wide geomagnetic disturbances observed during the IGY**, p. 943–950
Obashev, S. O.: **An electromagnetic mechanism of solar-prominence heating**, p. 951–954
Teĭfel', V. G.: **The difference in the spectral properties of areas on the lunar surface**, p. 955–959

Potter, H. I. and Streletskiĭ, Iu. S.: **A camera for the observation of the moon with the normal astrograph at the Main Astronomical Observatory of the Academy of Sciences, U.S.S.R. in Pulkovo,** p. 960–964
Manova, G. A.; Dokuchaeva, O. D. and Vorontsov-Vel'iaminov, B. A.: **Photometry of the comet Arend-Roland, 1956h,** p. 965–969
Fialko, E. I.: **A method for studying the distribution by mass of meteoric bodies,** p. 970–973
Rozenblium, N. D.: **The use of the photogrammetric method in determining the spatial coordinates of points on a meteor trajectory,** p. 974–985
Shklovskiĭ, I. S.; Esipov, V. F.; Kurt, V. G.; Moroz, V. I. and Shcheglov, P. V.: **An artificial comet,** p. 986–991
Pariiskiĭ, N. N. and Gindilis, L. M.: **Energy distribution in the gegenschein spectrum,** p. 992–1003
Gindilis, L. M.: **The annual variation in latitude of the gegenschein,** p. 1004–1006
Fesenkov, V. G.: **A two-channel polarimeter and its applications in atmospheric optics and astrophysics,** p. 1007–1022
Grebenikov, E. A.: **Secular perturbations in the theory of motion of an artificial earth satellite,** p. 1023–1032
Rubashevskiĭ, A. A. and Fedorov, E. P.: **The computation of mean latitude,** p. 1033–1039
Tovchigrechko, S. S.: **The pulse-phasing device of the electromechanical frequency divider of master oscillators for quartz clocks,** p. 1040–1042
Pikel'ner, S. B.: **The origin of the outer radiation band of the earth,** p. 1043–1044

Tokyo. Univ. Earthquake Research Institute, Bulletin, Vol. 37, No. 4, Dec. 1959

Rikitake, Tsuneji: **The anomalous behaviour of geomagnetic variations of short period in Japan and its relation to the subterranean structure, Pt. 9,** p. 545–570
Hôrai, Ki-iti: **Studies of the thermal state of the earth, Pt. 3, Terrestrial heat flow at Hitachi, Ibaraki Prefecture, Japan,** p. 571–592
Miyamura, Setumi: **Local earthquakes in Kii Peninsula, Central Japan, Pt. 2, A brief review of seismicity in Wakayama Prefecture based on intensity investigations,** p. 593–608
Miyamura, Setumi: **Local earthquakes in Kii Peninsula, Central Japan, Pt. 3, Temporary seismological network in the neighbourhood of Wakayama,** p. 609–635
Murai, Isamu and Tsuya, Hiromichi: **Size characteristics of the "Shirasu" deposit distributed in the southern part of Kyushu Island,** p. 637–647

U. S. National Bureau of Standards, Journal of Research, Sec. D, Radio Propagation, Vol. 64, No. 5, Sept./Oct. 1960

Watt, A. D.: **ELF electric fields from thunderstorms,** p. 425–433
Saran, Gurdip S. and Held, Gedalia: **Field strength measurements in fresh water,** p. 435–437
Keller, G. V. and Frischknecht, F. C.: **Electrical resistivity studies on the Athabasca Glacier, Alberta, Canada,** p. 439–448
Wheelon, Albert D.: **Amplitude distribution for radio signals reflected by meteor trails, Pt. 1,** p. 449–454
Fricker, S. J.; Ingalls, R. P.; Mason, W. C.; Stone, M. L. and Swift, D. W.: **Computation and measurement of the fading rate of moon-reflected UHF signals,** p. 455–465
Bremmer, H.: **On the theory of wave propagation through a concentrically stratified troposphere with a smooth profile, Pt. 1, Discussion of the extended W.K.B. approximation,** p. 467–482
Katz, I. and Spetner, L. M.: **Polarization and depression-angle dependence of radar terrain return,** p. 483–486
Bean, B. R.; Thayer, G. D. and Cahoon, B. A.: **Methods of predicting the atmospheric bending of radio rays,** p. 487–492
Sugar, George R.: **Loss in channel capacity resulting from starting delay in meteor-burst communication,** p. 493–494
Sugar, George R.; Carpenter, Robert J. and Ochs, Gerard R.: **Elementary considerations of the effects of multipath propagation in meteor-burst communication,** p. 495–500
King, G. A. M.: **Use of logarithmic frequency spacing in ionogram analysis,** p. 501–504
Smith, R. L.: **Guiding of whistlers in a homogeneous medium,** p. 505–508
Cullen, A. L.: **Propagation of microwaves through a magneto-plasma, and a possible method for determining the electron velocity distributions,** p. 509–513
Kogelnik, Herwig: **On electromagnetic radiation in magneto-ionic media,** p. 515–523
Marini, John W.: **Radiation and admittance of an insulated slotted-sphere antenna surrounded by a strongly ionized plasma sheath,** p. 525–532

Vaisala News, Helsinki, No. 5, May 1960

Väisälä, Vilho: **Note on determining thermometer lag coefficient,** p. 3; 10
Production of Väisälä radiosondes in pictures, p. 4–5
Nystén, Pauli: **Advantages of the Väisälä sounding system,** p. 6–7
Selection guide of Väisälä equipment for radiosonde station and combined radiosonde and radiowind station, p. 8–9

Weatherwise, Boston, Vol. 13, No. 4, Aug. 1960

A National Center for Atmospheric Research: Walter Orr Roberts named director, p. 139–140
Friedman, Don G. and Hendrick, Robert L.: **The role of a meteorologist in an insurance company,** p. 141–146
Stearns, Robert D.: **Dot: Hawaii's third hurricane,** p. 146–149
Arakawa, H.: **Typhoon Vera and its induced storm tide,** p. 150–152
Dexter, R. V.: **Nova Scotia's record snowstorm on Feb. 2–3, 1960,** p. 153–157
Tiros I concludes mission; Tiros II readied, p. 159–161; 180
Morris, Wesley R. and Peters, Norman L.: **Byrd Station (Inside Antarctica No. 5),** p. 162–165
Carter, Horace S.: **Josiah Meigs, pioneer weatherman,** p. 166–167; 181
Ludlum, David M.: **A circulation break between May and June,** p. 170–171; 175
Volunteer observers cited by Weather Bureau, p. 181

Zeitschrift für Meteorologie, Berlin, Vol. 14, No. 1, Jan. 1960

Wörner, H.: **Räumliche Darstellung von Wettervorgängen mit Hilfe von Anaglyphen,** [Spatial representation of weather phenomena by means of anaglyphs], p. 1–6
Sprenger, K.: **Die jahreszeitlichen Anomalien der Driftrichtung in der tiefen Ionosphäre nach Beobachtungen auf 245 kHz,** [Seasonal anomalies in drift direction in the low ionosphere according to observations at 245 kc/s], p. 6–16
Brandenburg, G.: **Beobachtung einer Sonnen-Halo-Erscheinung am 13.1.1960,** [Observation of a solar halo phenomenon on Jan. 13, 1960], p. 16–17
Provisorische Züricher Sonnenflecken-Relativzahlen für das Jahr 1959, [Provisional relative sunspot numbers at Zurich for 1959], p. 17

Vol. 14, No. 2, Feb. 1960

Koch, H. G.: **Zum Begriff des Mittelgebirgsföhns,** [Concept of föhn in medium-high mountains], p. 29–46
Hendl, Manfred: **Entwurf einer genetischen Klimaklassifikation auf Zirkulationsbasis,** [Draft of a genetic climatic classification on the basis of circulation], p. 46–50
Kaiser, Heinz and Schulze, Hans-Georg: **Blitzzählgeräte und ihre Anwendung für die Ortung von Gewitterherden,** [Lightning counters and their use for the location of thunderstorm centers], p. 50–55

PART IV. AUTHOR AND SUBJECT INDEXES

In this section will be found reference to the number given at the head of each abstract or entry. In Part I each entry begins with the number 11.11 and in Part II in the Bibliography on Night Airglow each entry begins with the number and letter 11K. This index is divided into three parts:

Index of Authors | Index of Subjects | Index of Geographic Locations

INDEX OF AUTHORS

Ackeret, J., 11 11–86
Acta Climatologica, 11 11–19
Advances in Agronomy, 11 11–1
Aichele, H , 11 11–184
Aikin, A C , 11 11–48
Akademiia Nauk SSSR, 11 1–2, 11K–60
Allard, N , 11K–1
Al'pert, Ia L (*ed*), 11K–85
Ambach, W , 11 11–106
Ament, W S., 11.11–110
American Geophysical Union, 11K–2
Andrillat, Y., 11K–3
Angus, D. E., 11.11–1
Armstrong, E. B., 11K–4
Arnett, A. B., 11.11–148
Arnold, A., 11.11–189
Ash, R. S., 11.11–221
Ashwell, I. Y., 11.11–210
Athay, R. G., 11.11–27, 11.11–28, 11.11–29
Atlas, D., 11.11–111
Ault, W. U., 11.11–3
Ausman, Miriam, 11.11–152

Bader, Michel, 11.11–24
Bagariatskiĭ, B. A., 11K–5
Bagdasarian, A. B., 11.11–11
Bakanauskas, S., 11.11–3
Banks, H. C., 11.11–3
Barber, D. R., 11K–6
Barbier, D., 11K–7, 11K–8, 11K–9, 11K–10, 11K–11, 11K–12, 11K–13, 11K–14, 11K–15
Barghoorn, E. S., 11.11–3
Barnard, J. L., 11.11–3
Barth, C. A., 11K–16, 11K–17, 11K–18
Bates, D. R., 11K–19, 11K–20, 11K–21, 11K–22
Beard, D. B., 11.11–30
Bedinger, J. F., 11K–36
Belmont, A. D., 11.11–3
Belogurov, Iu. A., 11.11–190
Berényi, D., 11.11–259
Berghuis, J., 11.11–101
Berry, R. J., 11.11–222
Berthold, W. K., 11.11–67
Bibl, K., 11.11–49
Bilancini, R., 11.11–77
Blackwell, D. E., 11K–23
Blamont, J. É., 11K–24
Blinova, E. N., 11.11–140
Bock, R., 11.11–68
Bollinger, C. J., 11.11–16
Bonacina, L. C. W., 11.11–229
Bouët, M., 11.11–206
Bowhill, S. A., 11.11–55
Boyé, M., 11.11–232
Brandt, J. C., 11K–25
Brazil Conselho Nacional de Geografia, 11.11–17
Brazil. Serviço de Meteorologia, 11.11–17
Bricard, J., 11.11–108
Briggs, J., 11.11–240
Bronshten, V. A., 11.11–2
Brooks, F. A., 11.11–185
Browne, Irene M., 11.11–3
Bruce, J. P., 11.11–157
Buleev, N. I., 11.11–2
Burkhanov, V. S. (*ed.*), 11.11–21
Burov, M. I., 11.11–78
Bushnell, Vivian (*ed.*), 11.11–3
Buyse, C., 11.11–63
Byram, E., 11K–72

Calder, K. L., 11.11–132
California Univ. at L.A., Institute of Geophysics, 11K–16, 11K–17
Campbell, W. H., 11.11–38
Canac, F., 11.11–277
Caryl, C. R., 11.11–170
Cavanillas, L., 11.11–269
Cehak, K., 11.11–103
Chamberlain, J. W., 11K–25, 11K–26, 11K–27, 11K–28
Chaplygin, E. I., 11.11–15
Chapman, S., 11K–29
Charakhch'ian, A. N., 11.11–45
Charakhch'ian, T. N., 11.11–45
Chernogorov, V. P., 11.11–243
Chicago. Univ. Dept. of Meteorology, 11.11–152
Chichagov, V. P., 11.11–258
Choubert, B., 11.11–232
Chubb, T. A., 11K–72
Colin, L., 11.11–59
Collis Smith, J. A., 11.11–5
Congress. House. Select Committee on Astronautics and Space Exploration, 11.11–87
Contract AF 18(600)-1746, 11K–94
Contract AF 19(122)-152, 11K–102
Contract AF 19(122)-453, 11K–16, 11K–17
Contract AF 19(122)-470, 11K–90, 11K–131
Contract AF 19(604)-1025, 11.11–218
Contract AF 19(604)-1718, 11K–114
Contract AF 19(604)-1831, 11K–55
Contract AF 19(604)-3475, 11.11–178
Contract AF 19(604)-3865, 11.11–119
Contract AF 19(604)-4563, 11.11–48, 11.11–55
Contract AF 61(052)-254, 11.11–111
Contract Cwb-9474, 11.11–102
Contract DA-36-039 SC-75064, 11.11–205
Contract N6ori-02036, 11.11–152
Cook, C. J., 11.11–178
Coudero, P., 11.11–23
Crary, A. P., 11.11–3
Curcio, J. A., 11.11–177
Currie, B. W., 11K–30
Curtis, R., 11.11–218

Dahler, H., 11.11–198
Dalgarno, A., 11K–31
Danner, Judith I. B., 11.11–201
Dantsig, N. M., 11.11–174
Darrabee, E. E., 11.11–205
Das, A. K., 11.11–41
Davidson, B., 11.11–207
Davies, J. T., 11.11–5
Davies, K., 11.11–50, 11.11–57
Debenham, F., 11.11–14
de la Harpe, G., 11K–97
Delannoy, Jean, 11K–32
Deloncle, M., 11.11–108
De Vuyst, A., 11.11–69
Dinkelacker, O., 11.11–184
Dirikis, M., 11.11–79
Djurle, E., 11.11–270
Dubin, M., 11.11–39
Dufay, M., 11K–33, 11K–34
Dugstad, I., 11.11–133
Dunn, G. E., 11.11–6
Durbin, K. A., 11.11–177
Durham, K., 11.11–5
Dzhordzhio, N. V., 11K–35

Eckel, E. F., 11.11–98
Edwards, H. D., 11K–36
Eesti NSV Teaduste Akadeemia. Füüsika ja Astronoomia Instituut, 11.11–80
Egan, R. D., 11.11–51
Egyed, L., 11.11–31
Elberty, W. T., 11.11–3
Elovskikh, M. P., 11.11–168
Elton, G. A. H., 11.11–5
Endlich, R. M., 11.11–143
Ericson, D. B., 11.11–3
Eropkin, D. I., 11K–37
Evans, D. C., 11.11–246

Fedorov, K. N., 11.11–141
Fedorova, N. I., 11K–38, 11K–39
Fedulova, M. N., 11.11–165
Fenn, R. W., 11.11–112
Fesenkov, V. G., 11K–82
Fisher, F. H., 11.11–274
Fishhova, L. M., 11K–136
Flohn, H., 11.11–202
Flood, W. A., 11.11–64
Flood Control Journal, 11.11–235
Forbush, S. E., 11.11–46
Frankiel, F. N., 11.11–4
Friedman, H., 11K–72
Frish, M. S., 11K–124
Fritz, S., 11.11–3, 11.11–85
Fuchs, V., 11.11–20

Galperin, G. L., 11K–40
Gartlein, C. W., 11.11–65
Gautier, T. N., 11.11–61
Gavin-Robinson, C. B., 11.11–214
Gazley, C., Jr., 11.11–40
Gazzola, A., 11.11–231
Gelcé, R., 11.11–122
Gerasimova, N. M., 11.11–42
Gerson, N. C., 11K–41
Getmantsev, G. G., 11.11–70
Ghosh, S. N., 11K–42, 11K–43
Gibson, W. E., 11.11–275
Giletti, B. J., 11.11–3
Gill, G., 11.11–98
Glaume, Jeannine, 11K–12, 11K–14
Gliddon, J. E. C., 11.11–52
Gōda, I., 11.11–149
Golay, M., 11.11–25
Goldstein, N., 11.11–3
Goody, R. M., 11K–138
Granderye, L. M., 11K–44
Green, Christine R., 11.11–236
Green, K. E., 11.11–3
Grigor'ev, A. A., 11.11–130
Grishin, N. I., 11.11–2
Groth, K., 11.11–5
Grundy, F., 11.11–5
Guilino, G., 11K–45

Hagan, R. M., 11.11–1
Hale, F. C., 11.11–199
Haley, A. G., 11.11–87
Haltiner, G. J., 11.11–134
Hammerling, P., 11.11–278
Hannell, F. G., 11.11–210
Harang, O., 11.11–66
Harper, W. G., 11.11–246
Harris, A. K., 11.11–67
Harrison, A. W., 11K–46, 11K–95
Hartlett, F. E., 11.11–187
Hashizume, A., 11K–98
Haupt, H., 11.11–273
Heppner, J. P., 11K–47
Higuchi, K., 11.11–242
Hikosaka, Tadayoshi, 11K–48
Hinzpeter, H., 11.11–271
Hirst, N. F., 11K–49
Hoffmeister, C., 11K–50, 11K–51
Holzapfel, L., 11.11–44
Hope, H. J., 11.11–67
Humphreys, D. G., 11.11–5
Hungary. Orszagos Meteorológiai Intézet, 11.11–18
Hunten, D. M., 11K–26, 11K–52, 11K–53, 11K–54, 11K–55
Hunten, Janet (*transl.*), 11K–131
Hurlbut, F. C., 11.11–90
Hurlbut, L. W., 11.11–1
Hurst, G. W., 11.11–200
Huruhata, Masaaki, 11K–56, 11K–57, 11K–58
Hutchinson, E., 11.11–5
Ingham, M. F., 11K–23
International Congress of Surface Activity, 11.11–5
International Geophysical Year, 1957/1958, 11K–59
International Journal of Bioclimatology, 11.11–267
International Union of Theoretical and Applied Mechanics, 11.11–4
Israël, G., 11.11–108
Itō, U., 11.11–125
Iudin, M. I., 11.11–2, 11.11–4, 11.11–211
Iuri, K., 11.11–37

Jacobs, T. A., 11.11–98
Jalu, R., 11.11–161
James, J. F., 11K–61
Johns, J., 11.11–240
Johnson, F. S., 11.11–53
Jones, A. C., 11.11–172
Jones, A. V., 11K–46, 11K–55, 11K–62, 11K–95
Journal of Atmospheric and Terrestrial Physics, 11.11–71
Jursa, A., 11K–128
Justyák, J., 11.11–259

Kalashnikov, A. G., 11.11–72
Kaplan, J., 11K–16, 11K–18, 11K–63
Kendall, P. C., 11.11–52
Kerfoot, H. P., 11.11–93
Kerlee, D. D., 11.11–47
Khvostikov, I. A., 11.11–2, 11K–64
Kibel', I. A., 11.11–2
Kingery, W. D., 11.11–244
Kivel, B., 11.11–278
Knars, R. Ia., 11.11–216
Knox, G. A., 11.11–3
Koeckelenbergh, A., 11.11–32
Kondô, J., 11.11–188
Kondrat'ev, K. Ia., 11.11–168
Konstantinov, A. R., 11.11–2
Koomen, M. J., 11K–65, 11K–140
Kooy, J. M. J., 11.11–101
Kopcewicz, T., 11.11–7
Koppány, G., 11.11–162
Kosibowa, Stefania, 11K–66
Kraichnan, H., 11.11–135
Kramer, P. J., 11.11–1
Krasovski, V. I., 11K–67, 11K–68, 11K–69, 11K–70, 11K–85
Kremenskaia, N. L., 11.11–183
Kreplin, R. W., 11K–71
Krichak, O. G., 11.11–2
Krienke, O. J., Jr., 11.11–47
Kulp, J. L., 11.11–3
Kuo, H. L., 11.11–127

Kupperian, J. E., Jr., 11K–71, 11K–72
Kvifte, G., 11K–73, 11K–74

LaMer, V. K., 11.11–5
La Toison, M., 11.11–169
Landsberg, H. E. (*ed.*), 11.11–4
Lange-Hesse, G., 11K–75
Lautzenheiser, R. E., 11.11–229
Lawrence, R. S., 11.11–54
Lebel, F., 11.11–122
Leblanc, F., 11K–128
Ledwina, W., 11.11–264
Leeper, G. A., 11.11–179
Lees, S., 11.11–205
Lequeux, J., 11.11–83
Levi, M., 11.11–104
Levy, B., 11.11–102
Lewińska, Janina, 11.11–208
Lewis, H. E., 11.11–265
Liman, St., 11.11–263
Link, F., 11K–76
Liszka, L., 11K–77
Little, C. G., 11.11–54
Liu, V. C., 11.11–84
Loewe, F., 11.11–191
Lomonosov, M. V., 11.11–247
London. Imperial College of Science & Technology. Dept. of Meteorology, 11.11–111
London, Ontario. Univ. of Western Ontario. Dept. of Physics, 11K–114, 11K–131
Long, R. S., 11.11–94
Lord, J. J., 11.11–47
Lorents, D., 11.11–178
Lowenthal, M., 11 11–189
Luzhnaia, N P, 11.11–160
Lyons, J. B., 11.11–3

McArthur, I. K. H., 11.11–5
McCaulley, J. W., 11K–78, 11K–79, 11K–109, 11K–110, 11K–113
McCrehan, R. H., 11.11–3
McGill Univ. Arctic Met. Research Group, 11.11–119
Mack, J. E., 11K–26
McLean, G. S., 11.11–143
McLeod, K. T., 11.11–121
Maier-Leibnitz, H., 11K–45
Makarov, E. A. (*transl.*), 11K–85
Malick, M., 11.11–268
Malkus, Joanne S., 11.11–128
Manabe, S., 11.11–234
Manring, E. R., 11K–36, 11K–80
Marchuk, G. I., 11.11–2, 11.11–140
Marcus, L., 11.11–187
Mariners Weather Log, 11.11–158
Markgraf, H., 11.11–203
Marovich, E., 11K–78, 11K–106, 11K–109, 11K–113
Marshall, E. W., 11.11–3
Martinov, M., 11.11–163
Massey, H. S. W., 11K–19
Masson, H., 11.11–171
Masterton, J. P., 11.11–265
Matsuno, T., 11.11–234
Matsushita, S., 11K–79
Megill, L. R., 11K–81, 11K–106, 11K–107, 11K–108
Megrelishvili, T. G., 11K–82
Meijers, P. G., 11.11–1
Meinel, A. B., 11K–83, 11K–84
Meredith, L. H., 11K–47
Merle, Marie, 11.11–277
Meteorological Bulletin, Taipei, 11.11–153, 11.11–154
Meteorological Magazine, London, 11.11–246
Metnieks, A. L., 11.11–114
Metz, A., 11.11–279
Michard, R., 11.11–33
Miller, A., 11.11–218
Millter, J. (*transl.*), 11.11–215
Milly, G. H., 11.11–132
Mishutin, D. A., 11.11–164
Mitra, S. K., 11K–85
Miura, A., 11.11–224
Miyakoda, K., 11.11–234, 11.11–129
Mocker, H., 11.11–106
Model, F., 11.11–181
Mohr, J. L., 11.11–3
Moiseiwitsch, B. L., 11K–21
Montalbetti, R., 11K–86
Montalto, M., 11.11–231
Monteith, J. L., 11.11–219
Monin, A. S., 11.11–2
Moore, F. K., 11.11–275
Mordukhovich, M. I., 11.11–280
Morokhovets, K. A., 11.11–248
Moroz, V. I., 11K–141
Morozov, V. M., 11K–87
Morrison, S. D., 11.11–266
Mossop, S. C., 11.11–111
Mrkos, A., 11K–88
Muchnik, V. M., 11.11–247
Münch, G., 11.11–135
Muller, P., 11.11–88
Murakami, T., 11.11–234
Muromtsev, A., 11.11–10

Nader, J. S., 11.11–113
Nakagawa, Y., 11.11–131
Nakamura, J., 11K–56, 11K–89
Nakamura, M., 11K–98
Namias, J., 11.11–192
Narayana, J. V., 11.11–41
Needham, P. R., 11.11–172
Nelson, M. E., 11.11–47
Nemeth, E., 11.11–250
Nesina, L. V., 11.11–195
N. Y. Univ. Research Div. College of Engineering. Dept of Met. and Oceanog., 11.11–102
Newcomb, S., 11K–13
Newstein, H., 11.11–102
Nicholls, R. W., 11K–90, 11K–114
Nicolet, M., 11K–91, 11K–92, 11K–93
Nikitenko, S. F., 11.11–183
Noguchi, K., 11.11–125
Norden-Ketay Corp., 11K–94
Norman, A. G. (*ed.*), 11.11–1
Noxon, J. F., 11K–95

O'Brien, B. J., 11K–96, 11K–97
Obukhov, A. M., 11.11–2
Ogawa, M., 11K–98, 11K–127
Ogura, Yoshimitsu, 11.11–136
Ohsawa, K., 11.11–159
Oksman, J., 11.11–55
Ōkubo, T., 11.11–125
Okuta, Y., 11.11–234
Omholt, A., 11K–99
Onufrienko, L. G., 11.11–126
Opdyke, N. D., 11.11–73
Oreshkina, N. S., 11 11–237
Orrall, F. Q., 11.11–29
Orvig, S., 11.11–119

Panchev, St., 11.11–223, 11.11–225, 11.11–254
Panofsky, H. A., 11.11–218
Parczewski, W., 11.11–237
Parkinson, R. W., 11.11–95
Parshin, V. N., 11.11–248
Partanen, E. N., 11.11–3
Paschinger, H., 11.11–256
Pasechnik, I. P., 11.11–196
Pastiels, R., 11K–100
Paton, J., 11K–50
Paynter, R. A., Jr., 11.11–3
Ped', D. A., 11.11–165
Penner, S. S., 11.11–98
Pennsylvania. State Univ. Ionosphere Research Lab., 11.11–48, 11.11–55
Pennsylvania. State Univ. Mineral Industries Experiment Station. Dept. of Meteorology, 11.11–218
Pereira, H. C., 11.11–107
Perlat, A., 11.11–109
Perrin, M., 11K–101, 11K–142
Peshkova, I. I., 11.11–124
Perkovšek, Z., 11.11–166
Petrie, W., 11K–102
Pettit, H. B., 11K–80

Pettit, Helen, 11K–7
Pflugbeil, C., 11.11–233
Picknett, R. G., 11.11–5
Pistiner, J. S., 11.11–99
Pivovarova, Z. I., 11.11–2
Platagea, Gh., 11.11–249
Platagea, M., 11.11–249
Pleshkova, T. T., 11.11–2
Podzimek, J., 11.11–8
Polanyi, J. C., 11K–103
Pollak, L. W., 11.11–114
Polunin, N., 11.11–3
Pomerantz, M. A., 11.11–34
Ponomarev, L. E., 11.11–175
Popov, O. V., 11.11–252
Portig, W., 11.11–238
Pothecary, I. J. W., 11.11–120
Potnis, V. R., 11.11–34
Powell, C. F., 11.11–43
Priestley, C. H. B., 11.11–137
Primault, B., 11.11–186
Prince, A. E., 11.11–3
Prokudina, V. S., 11K–104
Prudhomme, A., 11.11–144
Purdy, C. M., 11K–110, 11K–113
Pushkarev, V. F., 11.11–2

Quednau, W., 11.11–260

Raimond, J. J., Jr., 11.11–35, 11.11–100
Rain Simulation Research Institute, 11.11–204
Rapoport, V. O., 11.11–70
Reed, S. G., Jr., 11.11–281
Rees, M. H., 11K–106, 11K–112
Rein, F., 11.11–230
Reismann, H., 11.11–99
Renau, J., 11.11–56
Roach, F. E., 11K–78, 11K–79, 11K–105, 11K–106, 11K–107, 11K–108, 11K–109, 11K–110, 11K–111, 11K–112, 11K–113
Robinson, D., 11K–114
Robley, R., 11K–115, 11K–116
Rocard, Y., 11.11–276
Rodewald, M., 11.11–155
Rodhe, B., 11.11–180
Rodionov, S. F., 11K–117, 11K–118
Rodney, W. S., 11.11–270
Rötschke, M., 11.11–115
Roosma, A., 11.11–257
Rose, D. C., 11.11–34
Rosenbaum, J. H., 11.11–282
Roulleau, Maud, 11.11–226
Rozenburg, G. V. (*transl.*), 11K–85
Rozhkovskiĭ, D. A., 11K–119
Rubinshteĭn, E. S., 11.11–182
Runcorn, S. K., 11.11–73
Rundle, H. N., 11K–23
Russell, M. B., 11.11–1
Rybakova, E. V., 11.11–74

Sadokov, V. P., 11.11–2, 11.11–147
Saitô, Bunichi, 11K–48
Sandström, A. E., 11.11–34
Saskatchewan. Univ. Dept. of physics, 11K–55, 11K–102
Schade, W. J., 11K–17
Schamberg, R., 11.11–91
Schatzman, E., 11.11–89
Scherhag, R., 11.11–116
Schindler, G., 11.11–197
Schotland, R. M., 11.11–102
Schultz, H. B., 11.11–185
Schulze, E. P., 11.11–193
Schulze, R., 11.11–179
Schweizer Aero-Revue, 11.11–95
Scolnik, R., 11K–65
Scorer, R. S., 11.11–138
Serra, A., 11.11–17
Sewenig, K., 11.11–156
Shakhauvarov, D. N., 11.11–74
Sharonov, V. V., 11.11–2, 11.11–81
Shefov, N. N., 11K–120
Shekhtman, E. D., 11.11–147
Shell Aviation News, 11.11–241
Sheppard, P. A., 11.11–4, 11.11–142
Shklovskiĭ, I. S., 11K–87, 11K–121, 11K–122, 11K–123
Sholokhova, E. D., 11K–124
Showalter, A. K., 11.11–105
Siemon, H., 11.11–253
Singer, I. A., 11.11–187
Skul'skiĭ, V. Iu., 11.11–82
Small, R., 11K–102
Smiley, C. R., 11.11–150
Smith, D. D., 11.11–239
Smith, M. E., 11.11–187
Smolen, F., 11.11–173
Sokolov, I. F., 11.11–215
Sommer, L. A., 11K–125
Sovetskaia Antarkticheskaia Ekspeditsiia, 1955–, 11.11–21
Spies, K., 11.11–75
Sprague, G., 11.11–65
Stanford Research Institute, 11.11–178
Stewart, D. T., 11K–126
Stoiber, R. E., 11.11–3
Stotsenko, A. V., 11.11–12
Stringer, E. T., 11.11–255
Styra, V. I., 11.11–9
Sutcliffe, R. C., 11.11–117, 11.11–123
Svorad, D., 11.11–261, 11.11–262
Syōno, S., 11.11–234
Szeged, Hungary. Tudomany, 11.11–19

Tanaka, Yoshio, 11K–127, 11K–128
Tandberg, Hanssen, E., 11K–107, 11K–108
Tatarskiĭ, V. I., 11.11–13
Taylor, C. L., 11.11–199
Taylor, R. J., 11.11–139
Teare, J. D., 11.11–278
Thomas, M. K., 11.11–157
Thomas, R. N., 11.11–27, 11.11–28
Tikhonov, A. N., 11.11–74
Tingwaldt, C. P., 11.11–176
Tochilov, V. I., 11.11–227
Todd, E. P., 11.11–97
Tohmatsu, Takao, 11K–57, 11K–129, 11K–137
Tousey, R., 11K–65, 11K–130
Tu, Hsin-Yüan, 11.11–201
Tulinov, V. F., 11.11–45

United Research Inc., Cambridge, Mass., 11.11–205
U. S. Navy Weather Research Facility, 11.11–145
U. S. Weather Bureau, 11.11–151, 11.11–217
Unsöld, A., 11.11 26

Vaadia, Y., 11.11–1
Valtat, B., 11.11–144
Van Miegham, J. (*ed.*), 11.11–4
Vassy, Arlette T., 11K–131, 11K–142
Vassy, E., 11K–132
Vegard, L., 11K–133
Venkatesan, D., 11.11–46
Volz, F., 11.11–272, 11K–138
Vorontsov, P. A., 11.11–209,

Waag, R. C., 11.11–65
Wagner, R. (*ed.*), 11.11–19
Wait, J. R., 11.11–75
Waldmeier, M., 11.11–36
Wallace, L., 11K–139
Wang, G., 11.11–118
Ward, F. W., Jr., 11.11–76
Wark, D. Q., 11K–134
Watts, J. M., 11.11–57
Weekes, K., 11.11–58
Wehner, B., 11.11–228
Weickmann, H. K., 11.11–112
Weill, G., 11K–32
Weisbrod, S., 11.11–59
Wellnerová, J., 11.11–261, 11.11–262
Western Ontario. Univ. Dept. of Physics, 11K–90
Westland, R. A., 11.11–199
Wexler, H., 11.11–85

Wheelon, A. D., 11.11–60, 11.11–135
Whiting, Georgia C., 11.11–167
Widdowson, E. M., 11.11–265
Wiersma, D., 11.11–1
Williams, G. C., 11.11–213
Willig, F. J., 11.11–283
Willis, D. R., 11.11–92
Wischmeier, W. H., 11.11–239
Witt, G., 11.11–128
Woffinden, C. W., 11.11–146
Wollin, G., 11.11–3
Worthington, L. V., 11.11–3, 11.11–194
Wright, J. W., 11.11–61
Wulf, O. R., 11K–135
Wuori, A. F., 11.11–245
Yamamoto, Giichi, 11.11–188
Yano, Kyô, 11K–48
Zatsepin, G. T., 11.11–42
Zelikoff, M. (*ed.*), 11K–92
Zierep, J., 11.11–220
Zikeev, Nina (s), 11.11–22
Zmuda, A. J., 11.11–62

INDEX OF SUBJECTS

Acoustical propagation, 11.11–275, 11.11–282
Acoustical propagation theories, 11.11–13
Acoustical temperature determination, 11.11–280
Acoustical waves, 11.11–277
Adsorption, 11.11–5
Aerodynamic drag and heating, 11.11–40
Aerodynamics, 11.11–84
Aerosol meters, 11.11–112
Afterglow spectra, 11K–128
Age of Earth, 11.11–23
Age of sun, 11.11–23
Age of universe, 11.11–26
Ageostrophic winds, 11.11–124
Agricultural meteorology, 11.11–268
Air density, 11.11–95
Air mass modification, 11.11–117, 11.11–120
Air mass transformation, 11.11–212
Airglow, 11K–4, 11K–20, 11K–22, 11K–49, 11K–92
Airglow bibliographies, 11K–59
Airglow cells, 11K–107, 11K–108
Airglow investigations, 11K–55, 11K–56, 11K–61
Airglow networks, 11K–30
Airglow radiation, 11K–8
Airglow research, 11K–90
Airglow spectroscopy, 11K–53
Airplane observation of dust storms, 11.11–214
Airplane propagation observations, 11.11–110
Alkaline injection in upper atmosphere, 11K–142
Annual night airglow variations, 11K–51
Anomalous sound propagation, 11.11–276
Antarctic airglow observations, 11K–56, 11K–88
Antarctic research, 11.11–14, 11.11–20
Anticyclone movement forecasting, 11.11–160
Arctic analysis, 11.11–119
Arctic Ice Island (T-3), 11.11–3
Arctic ice movement forecasting, 11.11–15
Areal precipitation distribution, 11.11–231
Arid zones, 11.11–257
Astronautics, 11.11–86, 11.11–87, 11.11–89, 11.11–95
Astrophysics, 11.11–89
Atlantic hurricanes, 11.11–6
Atlases, 11.11–16
Atmospheric absorption, 11K–131
Atmospheric circulation, 11.11–142
Atmospheric circulation theories, 11.11–141
Atmospheric composition, 11.11–95
Atmospheric diffusion and air pollution symposia, 11.11–4
Atmospheric diffusion calculations, 11.11–132
Atmospheric pollution formulas, 11.11–138
Atmospheric pollution instruments, 11.11–113
Atmospheric radioactivity, 11.11–9
Atmospheric scattering, 11K–72
Atmospheric tidal effects on night airglow, 11K–77
Atmospheric transmission coefficients, 11.11–177
Atmospheric waves, 11.11–196
Atom bomb tests, 11.11–276
Atomic explosion effects on weather, 11.11–233
Atomic oxygen distribution, 11K–93
Auroral distribution, 11.11–65
Auroral emissions, 11K–91
Auroral height estimates, 11K–134
Auroral hydrogen lines, 11K–86
Auroral intensities, 11K–117
Auroral intensity measurements, 11K–46
Auroral investigations, 11K–29
Auroral line absorption, 11K–131
Auroral luminosity, 11K–35
Auroral luminosity curve, 11K–78
Auroral networks, 11K–30
Auroral observations, 11K–58, 11K–63, 11K–74
Auroral oxygen lines, 11K–125
Auroral particles, 11.11–83
Auroral physics, 11K–20
Auroral research, 11K–55, 11K–90
Auroral-solar relationships, 11K–5
Auroral spectra, 11K–15, 11K–37, 11K–42, 11K–83, 11K–100, 11K–122, 11K–133
Auroral spectral intensity, 11K–110, 11K–113, 11K–114
Auroral spectroscopy, 11K–53, 11K–131
Auroral temperatures, 11K–134
Auroral wave length measurement, 11K–133
Auroras, 11K–4, 11K–7, 11K–70, 11K–75, 11K–84, 11K–132, 11K–135
Bai-u, 11.11–234
Balloon-borne telescopes, 11.11–35
Barometric profile, 11.11–197
Bibliography on human bioclimatology, 11.11–267
Bioclimatology, 11.11–260
Biological effects of radiation, 11.11–179
Biological effects of ultraviolet radiation, 11.11–174
Biometeorology, 11.11–174
Black body radiation, 11.11–25
Body heat regulation, 11.11–264
Budyko, M. I., 11.11–130

Cambridge Observatories expedition, 11K–23
Cellular convection, 11.11–131
Chemical aeronomy, 11K–17
Chemiluminescence, 11K–103
Chemisorption, 11.11–5
Chromosphere and prominences, 11.11–36
Chromospheric prominences, 11.11–32
Chromospheric structure, 11.11–28
Chromospheric temperature, 11.11–27
Climate of Antarctica, 11.11–21
Climate of Armenian S.S.R., 11.11–11
Climate of Brazil, 11.11–17
Climate of Khanka Valley, 11.11–12
Climatic atlas of Hungary, 11.11–18
Climatic atlases, 11.11–17
Climatic changes, 11.11–257
Climatic classifications, 11.11–12, 11.11–268
Climatic morphology, 11.11–256
Climatic stress-nutrition relationships, 11.11–266
Cloud drop growth, 11.11–225
Cloud photographs, 11.11–85, 11.11–219
Cloud physics textbooks, 11.11–8
Coal mining, 11.11–253
Cold air outbreaks, 11.11–146
Cold front forecasting, 11.11–162
Cold front movement, 11.11–166
Cold poles, 11.11–182
Cold waves in Alaska, 11.11–213
Color photometry, 11.11–25
Condensation nuclei, 11.11–8, 11.11–112
Condensation processes, 11.11–227
Conference on surface activity, 11.11–5
Convection calculation, 11.11–128
Convection theories, 11.11–137
Convective clouds, 11.11–225, 11.11–226
Convective rainfall, 11.11–125, 11.11–234
Convective rainfall forecasting, 11.11–234
Cosmic radiation, 11.11–179
Cosmic ray bursts, 11.11–41
Cosmic ray equator, 11.11–34
Cosmic ray events at high altitudes, 11.11–45
Cosmic ray intensities, 11.11–45, 11.11–46
Cosmic ray measurement techniques, 11.11–47
Cosmic ray research, 11.11–83
Cosmic ray showers, 11.11–42
Cosmic ray theories, 11.11–43
Cosmogony, 11.11–23
Cosmology, 11.11–31
Counterglow, 11K–119
Cyclone movement, 11.11–147
Czech language, 11.11–8

D region, 11.11–48, 11K–92
Darcy's law, 11.11–250, 11.11–252
Dayglow, 11K–87
Dayglow theories, 11K–25
Daytime sky brightness, 11K–87
Difference equations, 11.11–129
Dipole fields, 11.11–74
Direct solar radiation intensities, 11.11–173
Dispersion equations, 11.11–70
Diurnal cosmic ray variations, 11.11–46
Diurnal global radiation, 11.11–170
Diurnal ionospheric variations, 11.11–50
Diurnal upper air temperature variations, 11.11–190
Diurnal wind variations, 11.11–134
Doppler displacement of oxygen, 11K–134
Drag coefficients, 11.11–90, 11.11–91
Drop size measurement, 11.11–108
Drought probabilities, 11.11–236
Dry winds, 11.11–211
Dust in atmosphere, 11.11–115
Dust measurements, 11.11–115
Dust storms, 11.11–214, 11.11–215
Dynamic meteorology textbooks, 11.11–7

Earth currents, 11.11–72
Earth's shape, 11.11–75
Eddy viscosity, 11.11–134
Effective radiation, 11.11–168
Elbrus Expedition, 1949–52, 11K–118
Electromagnetic wave propagation, 11.11–70
Electromagnetic wave propagation theories, 11.11–13
Electron density in F2 region, 11.11–52
Electron scattering, 11.11–178
Electronic computer applications, 11.11–101
Electronic computers, 11.11–122
Electrophotometric observations of airglow, 11K–136
Electrophotometry, 11K–35
Electrostatic analyzers, 11.11–24
Electrostatics, 11.11–62
Emission layer heights, 11K–57
Emission phenomena textbooks, 11K–132
Energy balance of man, 11.11–265
Equations of motion, 11.11–134
Equatorial electrojet, 11.11–62
Equatorial ionosphere, 11.11–51
Erosion, 11.11–232
Evaporation and evapotranspiration data, 11.11–268
Evaporation control, 11.11–5
Evaporation instruments, 11.11–107
Evaporative cooling, 11.11–221
Evolution of convection, 11.11–128
Excessive rainfall, 11.11–234, 11.11–235, 11.11–238
Extinction coefficient, 11.11–271, 11K–106

Fabry-Pérot interferometer, 11K–1, 11K–4, 11K–101
Fisheries research, 11.11–172
Fluid mechanics, 11.11–135, 11.11–277
Fluorescence, 11K–121
Fluorescence in upper atmosphere, 11K–122
Föhn development, 11.11–212
Föhn winds, 11.11–210, 11.11–206
Fog nucleation, 11.11–114
Fog particles, 11.11–108
Fog studies, 11.11–114
Forecast improvement, 11.11–123
Forest influences on dust distribution, 11.11–115
Forest shelter belt effects, 11.11–211
Forest shelter belt effects on local circulation, 11.11–209

Formation of heavy elements, 11.11–26
Freezing nuclei, 11.11–112
Freezing of supercooled water, 11.11–222, 11.11–224
Freezing of water droplets, 11.11–226
Freezing temperatures, 11.11–226
Front effects on fog forecasting, 11.11–164
Frontal analysis, 11.11–117, 11.11–164
Frontal frequencies, 11.11–167
Frontal type precipitation, 11.11–164, 11.11–237
Frontal zone variations, 11.11–165
Frost damage to orchards, 11.11–184 to 11.11–186
Frost pockets, 11.11–258
Frost prevention, 11.11–184
Frost protection, 11.11–186
Frozen soil, 11.11–248
Fruit culture, 11.11–184, 11.11–185

General circulation, 11.11–181
Geoelectric sounding techniques, 11.11–74
Geographical meteorology, 11.11–255
Geomagnetic activity, 11.11–61
Geomagnetic disturbances, 11.11–76
Geomagnetic effects on cosmic rays, 11.11–83
Geomagnetic effects on night airglow, 11K–79, 11K–111, 11K–112
Geomagnetic effects on radio wave propagation, 11.11–75
Geomagnetic field intensities, 11.11–68
Geomagnetic field origin, 11.11–69
Geomagnetic micropulsations, 11.11–72
Geomagnetic research, 11.11–69
Geomagnetism, 11.11–69
Geophysical perturbations-solar eruption relationships, 11.11–33
Geophysical research, 11.11–86
Geopotential height changes, 11.11–201
Geopotential height forecasting, 11.11–124
Geostrophic wind errors, 11.11–143
Geostrophic winds, 11.11–160
Glacial climates, 11.11–257
Global precipitation variations, 11.11–233
Gradient wind errors, 11.11–143
Gravitational coagulation, 11.11–225
Green line emission, 11K–12
Green line emission layer temperature, 11K–101
Green night sky line, 11K–1
Green rain, 11.11–229
Green land ice temperature, 11.11–191
Ground water lowering, 11.11–253
Gulf Stream effects on frontal passage, 11.11–167
Gunn-Bellani integrator, 11.11–107

Hail, 11.11–246
Hail damage, 11.11–161
Hail formation, 11.11–247
Hailstone size, 11.11–161
Hailstorm analysis, 11.11–161
Hailstorm, Strasbourg (Aug. 11, 1958), 11.11–161
Halo photography, 11.11–273
Heat effects on man, 11.11–264
Heat exchange in reservoirs, 11.11–195
Herzberg band of O_2, 11K–16
High altitude nuclear explosions, 11.11–67
High level radiosonde data, 11.11–189
High level wind data, 11.11–189
Historical weather maps, 11.11–189
History of Antarctica, 11.11–14
History of geomagnetism, 11.11–69
Human bioclimatology, 11.11–262, 11.11–265
Humboldt, Alexander von, 11.11–181
Humidity effects on parasites, 11.11–260
Humidity profiles, 11.11–188
Hurricane "Audrey" (1957), 11.11–157
Hurricane "Carrie" (1957), 11.11–156
Hurricane frequencies, 11.11–150
Hurricane kinematics, 11.11–152
Hurricane location, 11.11–105
Hurricane networks, 11.11–105
Hurricane research, 11.11–148
Hurricane research projects, 11.11–151
Hurricane textbooks, 11.11–6
Hurricane tracks, 11.11–157
Hydrogen in upper atmosphere, 11K–123
Hydrogen lines, 11K–86
Hydro-thermodynamic concepts, 11K–147
Hydroxyl (OH) emissions, 11K–38, 11K–39, 11K–69

Ice accumulation-temperature relationships, 11.11–191
Ice conditions along Swedish coast, 11.11–180
Ice crystal formation, 11.11–242
Ice nuclei formation, 11.11–226
Ice on highways, 11.11–228
Ice physics, 11.11–224
Ice shelf studies, 11.11–3
Icing condition, 11.11–228
Infiltration, 11.11–250, 11.11–252
Inflow angle in hurricane winds, 11.11–152
Infrared radiation, 11.11–179
Infrared radiation measurement techniques, 11.11–176
Infrared spectra, 11.11–176
Infrared spectrometers, 11K–95
Infrared spectrum of night airglow, 11K–94, 11K–141
Insensible weight loss, 11.11–199
Instability line, 11.11–159, 11.11–161
Interference filters, 11.11–271
IGY airglow program, 11K–2, 11K–60
IGY auroral program, 11K–30, 11K–60
IGY bibliographies, 11K–59
IGY meteorological analyses, 11.11–2
IGY noctilucent cloud program, 11.11–78 to 11.11–82
IGY programs, 11K–29
Interplanetary conditions, 11.11–86, 11.11–95
Interplanetary flights, 11.11–87
Interplanetary gas measurement techniques, 11.11–24
Ion concentration in stratosphere, 11K–19
Ionization phenomena, 11K–91
Ionospheric absorption measurement, 11.11–50
Ionospheric dynamics, 11.11–49

Ionospheric electric fields, 11.11–62
Ionospheric electron density distribution, 11.11–48
Ionospheric electron diffusion, 11.11–52
Ionospheric ionization, 11.11–51
Ionospheric layers, 11K–19
Ionospheric movements, 11.11–53
Ionospheric physics, 11K–20
Ionospheric radio wave polarization, 11.11–54
Ionospheric radio wave propagation, 11.11–57
Ionospheric radio wave refraction, 11.11–59
Ionospheric radio wave scattering, 11.11–60
Ionospheric reflection, 11K–64
Ionospheric research, 11K–43
Ionospheric structure, 11K–91
Ionospheric temperature equalization, 11.11–53
Ionospheric winds, 11K–36, 11K–135
Irrigation-weather relationships, 11.11–209
Isothermal charts, 11.11–181
Isotropic turbulence, 11.11–135

Jet stream analysis, 11.11–145
Jet stream-cyclone relationships, 11.11–144
Jet stream reconnaissance, 11.11–145
Jet stream winds, 11.11–143

K-index, 11.11–71
Kinetic energy of rainstorms, 11.11–239

Latitude effects on airglow, 11K–89
Latitude effects on night airglow, 11K–48
Lee wave clouds, 11.11–219
Lee wave flow calculation, 11.11–220
Lithium in upper atmosphere, 11K–6, 11K–62
Local winds, 11.11–206, 11.11–208, 11.11–209
Long range forecasting, 11.11–124
Lyman alpha observation, 11.11–28
Lyman alpha radiation, 11K–72

Magnetic effects on ionosphere, 11.11–49
Magnetic index, 11.11–49
Magnetization of rocks, 11.11–73
Magnetohydrodynamics theory, 11.11–33
Maximum floods, 11.11–249
Mean 20 mb charts, 11.11–189
Meteor-night airglow relationships, 11K–51
Meteor physics, 11.11–40
Meteor shower effects on magnetic micropulsations, 11.11–38
Meteoritic dust measurement, 11.11–39
Meteorological data, Arctic, 11.11–3
Meteorological influences on emotional reactions, 11.11–262
Meteorological influences on insomnia, 11.11–261
Microclimatology periodicals, 11.11–19
Molecular excitation studies, 11K–90
Molecular flow, 11.11–90 to 11.11–92
Monin-Obukhov similarity theory, 11.11–139
Monsoon inversion, 11.11–203
Monsoons, 11.11–202, 11.11–203
Moon rockets, 11.11–100, 11.11–101

National Hurricane Research Project, 11.11–148
Natural synoptic periods, 11.11–165
Navigation in hurricanes, 11.11–156
Night airglow, 11K–5, 11K–7, 11K–8, 11K–13, 11K–19, 11K–31, 11K–45, 11K–64, 11K–65, 11K–70, 11K–71, 11K–75, 11K–84, 11K–85, 11K–91, 11K–126, 11K–135
Night airglow absorption, 11K–131
Night airglow anomalies, 11K–89
Night airglow bibliographies, 11K–85
Night airglow continuum, 11K–31, 11K–137
Night airglow data, 11K–74
Night airglow distribution with height, 11K–130
Night airglow emission, 11K–28, 11K–47, 11K–58, 11K–80, 11K–96, 11K–120, 11K–123
Night airglow infrared spectrum, 11K–3, 11K–95
Night airglow instrumentation, 11K–97, 11K–98
Night airglow intensities, 11K–78, 11K–110, 11K–112
Night airglow intensity distribution, 11K–113, 11K–136
Night airglow intensity measurements, 11K–46, 11K–98, 11K–114, 11K–117
Night airglow intensity variations, 11K–10, 11K–79, 11K–111
Night airglow investigations, 11K–29, 11K–139
Night airglow layer heights, 11K–12, 11K–105, 11K–106, 11K–118, 11K–134
Night airglow measurement techniques, 11K–88, 11K–138
Night airglow photometers, 11K–56
Night airglow photometry, 11K–44, 11K–66, 11K–81, 11K–82, 11K–105, 11K–142
Night airglow radiation, 11K–129
Night airglow research, 11K–3
Night airglow spectra, 11K–10, 11K–18, 11K–19, 11K–21, 11K–31, 11K–37, 11K–38, 11K–39, 11K–40, 11K–42, 11K–47, 11K–57, 11K–63, 11K–86, 11K–94, 11K–100, 11K–104, 11K–122, 11K–125, 11K–133, 11K–140, 11K–141
Night airglow spectroscopy, 11K–17
Night airglow theories, 11K–27, 11K–109
Night airglow ultraviolet bands, 11K–16
Night airglow variations, 11K–77
Night sky brightness, 11K–117
Night sky brightness measurement techniques, 11K–35
Night sky emission theories, 11K–68
Night sky infrared radiation, 11K–118
Night sky luminescence, 11K–14, 11K–15, 11K–119
Night sky photometers, 11K–138
Night sky spectrum, 11K–14, 11K–23, 11K–33, 11K–34, 11K–67, 11K–69
Nitrogen lines, 11K–66

Nitrogen oxide effects in airglow, 11K–92
Nitrogen-oxygen afterglows, 11K–17
Noctilucent cloud conferences, 11.11–80
Noctilucent cloud height photogrammetry, 11.11–78
Noctilucent cloud observation instructions, 11K–50
Noctilucent cloud observation techniques, 11.11–80
Noctilucent cloud observations, 11.11–79, 11.11–82
Noctilucent clouds, 11.11–2, 11.11–81
Nocturnal sky light, 11K–11
Nuclear explosion effects on geomagnetism, 11.11–67
Nuclear explosion effects on upper atmosphere, 11K–6
Nuclear meteorology textbooks, 11.11–9
Numerical forecasting, 11.11–2, 11.11–117, 11.11–129
Nutrition, 11.11–265, 11.11–266

Ocean-atmosphere interaction, 11.11–192
Ocean current observation manuals, 11.11–15
Ocean swell calculations, 11.11–122
Oceanic circulation, 11.11–141
Oceanic effects on temperature, 11.11–180
Oceanographic data, Indian Ocean, 11.11–10
Oceanography, 11.11–181
Oceanography of Indian Ocean, 11.11–10
Optical phenomena, 11K–49
Orchard heating, 11.11–185, 11.11–186
Origin of auroras, 11K–109
Origin of solar system, 11.11–31
Orographic effects on cold fronts, 11.11–166
Orographic effects on precipitation, 11.11–240
Oxygen afterglows, 11K–18
Oxygen lines, 11K–134
Oxygen spectra, 11K–139
Ozone distribution, 11K–63

Paleomagnetism, 11.11–73
Phenological atlas of Hungary, 11.11–18
Photochemistry of upper atmosphere, 11K–20
Photoelectric monochromators, 11K–33
Photoelectric nuclei counters, 11.11–114
Photoelectric photometers, 11K–98
Photoelectric photometry, 11K–57
Photoionization of sodium, 11K–99
Photoluminescence, 11K–132
Photometers, 11K–97
Photometric night airglow measurement techniques, 11K–137
Photometric observation techniques, 11.11–81
Planetary atmospheres, 11.11–37
Planetary frontal zone aloft, 11.11–165
Planetary-solar relationships, 11.11–16
Poisson's law, 11.11–150
Polar expeditions, 11.11–265
Polar incidence of aurora, 11.11–66
Pollen analysis, 11.11–257
Pollen in rain, 11.11–229
Potato storage, 11.11–221
Power spectra, 11.11–76
Precipitation charts, Czechoslovakia, 11.11–230
Precipitation variations, 11.11–231
Pressure change-wind shear relationships, 11.11–198
Pressure effects on sound, 11.11–274
Pressure effects on weight loss, 11.11–199
Pressure equalization, 11.11–53
Pressure fields, 11.11–231
Pressure variations at Gibraltar, 11.11–200
Pressure wave-thunderstorm relationships, 11.11–196
Primary cosmic rays, 11.11–47
Progress in human bioclimatology, 11.11–263
Project Jet Stream, 11.11–143
Psychological bioclimatology, 11.11–261, 11.11–262

Quaternary climates, 11.11–256

Radar echoes from auroras, 11.11–64, 11.11–65
Radiation absorption by glaciers, 11.11–106
Radiation effects on snow melt, 11.11–126
Radiation errors of radiosondes, 11.11–109
Radiation filtration by atmosphere, 11.11–179
Radiation instruments, 11.11–169
Radiation intensities, 11.11–168, 11.11–179
Radiation shield on radiosondes, 11.11–109
Radiation terminology, 11.11–169
Radiative transfer, 11K–25
Radio fading, 11.11–54, 11.11–57
Radio frequency disturbances, 11.11–63
Radio meteorology investigations, 11.11–110
Radio wave attenuation, 11.11–75
Radio wave reflection from auroras, 11.11–64
Radiocarbon dating, 11.11–23
Radiosonde data, 11.11–190
Radiosonde ventilation, 11.11–109
Raindrop erosion, 11.11–241
Rainfall analysis, 11.11–146
Rainfall effects of jet aircraft, 11.11–241
Rainfall intensities-soil loss relationships, 11.11–239
Rainfall probabilities, 11.11–236
Recombination in F region, 11.11–52, 11K–28
Record low temperatures, 11.11–22
Red auroral line, 11.11–66
Red emission lines, 11K–27, 11K–28
Red spectrum of night airglow, 11K–115
Refractometers, 11.11–270
Regression equations, 11.11–118
Residual cosmic radiation, 11.11–44
Resonance scattering, 11K–25
Richardson criterion, 11.11–133
Road traffic, 11.11–228
Roberts atmospheric diffusion theory, 11.11–132
Rocket airglow observations, 11K–140
Rocket aspect determinations, 11K–71
Rocket-borne photometers, 11K–47
Rocket instrumentation, 11.11–99

Rocket measurement of night airglow, 11K–130
Rocket propulsion, 11.11–98
Rocket re-entry, 11.11–99
Rocket soundings, 11.11–84, 11K–65
Rocket transfer, 11.11–94
Rotational temperature measurements, 11K–53

Sand particle moisture retention, 11.11–251
Satellite drag, 11.11–90 to 11.11–93
Satellite ionospheric electron density measurements, 11.11–54
Satellite launching history, 11.11–88
Satellite measurement of meteoritic dust, 11.11–39
Satellite optical observation techniques, 11.11–97
Satellite orbits, 11.11–93, 11.11–96, 11.11–100
Satellite photography, 11.11–85
Satellite re-entry, 11.11–92
Satellite research, 11.11–88
Satellites, 11.11–83
Scintillation of stars, 11.11–13
Sea level forecasting, 11.11–122
Sea surface temperature variations, 11.11–194
Sea temperature variations, 11.11–193
Seasonal airglow intensity variations, 11K–8
Secular geomagnetic variations, 11.11–68
Seismic waves, 11.11–276
Semi-annual pressure waves, 11.11–141
Serial publications, 11.11–19
Shock waves, 11.11–276, 11.11–278, 11.11–283
Shower formation, 11.11–240
Silting, 11.11–216, 11.11–232
Sky light color, 11.11–272
Slope microclimatology, 11.11–258
Smoke plume behavior, 11.11–138
Snow and ice constructions, 11.11–244
Snow cover compaction, 11.11–245
Snow density data, 11.11–245
Snow drifts, 11.11–258
Snow measurement techniques, 11.11–104
Snow melt forecasts, 11.11–243
Snow melt formulas, 11.11–126
Snow melt intensity computation methods, 11.11–126
Snow melt runoff, 11.11–248
Snow surveys, 11.11–104, 11.11–243
Sodium absorption, 11K–26
Sodium D line, 11K–26, 11K–127
Sodium D line emission, 11K–24, 11K–140
Sodium emission, 11K–36, 11K–96
Sodium emission variations, 11K–52
Sodium in atmosphere, 11K–25
Sodium lines, 11K–99
Sodium spectra, 11K–40
Soil moisture content, 11.11–248
Soil moisture movement, 11.11–227
Soil moisture retention, 11.11–251
Soil-plant-water relationships, 11.11–1
Solar activity, 11.11–36
Solar disturbances, 11.11–34
Solar eclipse, Feb. 1952, 11.11–29
Solar effects on cosmic rays, 11.11–42
Solar effects on night airglow, 11K–118
Solar energy utilization, 11.11–171
Solar eruptions, 11.11–33
Solar limb prominences, 11.11–29
Solar plasma-magnetic field relationships, 11.11–30
Solar radiation, Arctic, 11.11–3
Solar radiation data, 11.11–160, 11.11–173
Solar radiation effects on satellites, 11.11–96
Solar radiation instruments, 11.11–107
Solar radiation measurements, 11.11–172
Solar wind measurements, 11.11–24
Sound absorption, 11.11–274
Soviet participation in IGY, 11.11–72
Soviet satellite, 1959 Theta (Lunik III), 11.11–100
Space medicine, 11.11–95
Spectral line 5577 Å [OI], 11K–15, 11K–57, 11K–58, 11K–66, 11K–109, 11K–129
Spectral line 5577 Å [OI] intensity variations, 11K–77, 11K–79, 11K–110 to 11K–113, 11K–142
Spectrographs, 11K–74, 11K–102
Spectrometers, 11K–45
Spectrophotometric observations, 11K–126
Spectroscopic problems of star populations, 11.11–26
Sporadic E layer (Es), 11.11–55, 11.11–58, 11.11–61
Spraying, 11.11–269
Spread F echoes, 11.11–56
Spring frosts, 11.11–183
Stack effluent diffusion, 11.11–138, 11.11–187
Star populations, 11.11–26
Statistical methods in climatology, 11.11–254
Statistical theory of turbulence, 11.11–136
Stellar evolution, 11.11–26
Stellar magnitude and radiation, 11.11–25
Storm forecasting 11.11–121
Stratospheric analysis, 11.11–119
Stratospheric temperatures, 11.11–189
Stratospheric winds, 11.11–189
Summer precipitation variability, 11.11–230
"Sunrise effects" on ionosphere, 11.11–48
Sunspot effects on rainfall, 11.11–232
Sunspot-night airglow relationships, 11K–51
Sunspot observation, 11.11–35
Sunspot photographs, 11.11–35
Sunspots, 11.11–32, 11.11–36
Superadiabatic temperature profiles, 11.11–137
Superadiabatic wind profiles, 11.11–137
Supercooled water drops, 11.11–224
Supersonic raindrops, 11.1–1 241
Supersonic speeds, 11.11–283
Surface effects on air mass, 11.11–212
Synoptic analyses of Mediterranean Region, 11.11–116
Synoptic analysis of air masses, 11.11–120
Synoptic analysis of warm fronts, 11.11–163
Synoptic case histories, 11.11–116, 11.11–121
Synoptic chart analysis, 11.1–1 116

Synoptic conditions for frost, 11.11–183
Synoptic conditions for heavy rainfall, 11.11–238

Temperature calculations, 11.11–103
Temperature data, 11.11–180
Temperature distribution, 11.11–140
Temperature effects on parasites, 11.11–360
Temperature inversions, 11.11–187
Temperature profiles, 11.11–188
Temperature variations, 11.11–103, 11.11–172
"Temporal," 11.11–238
Terminal velocity of drops, 11.11–223
Three-dimensional harmonic waves, 11.11–127
Thunder squalls, 11.11–206
Thunderstorms, 11.11–159
Tillage operations, 11.11–269
Tornado research projects, 11.11–151
Trade wind direction in geological times, 11.11–73
Trajectory determination of supersonic bodies, 11.11–101
Translation of textbooks, 11K–85
Tropical cyclone tracks, 11.11–155
Tropical jet stream, 11.11–144
Tropical storms over Maritime Provinces, 11.11–121
Tropospheric propagation theories, 11.11–13
Troughs and ridges, 11.11–146
Turbidity, 11.11–173, 11.11–272
Turbidity calculations, 11.11–271
Turbulence, 11.11–133
Turbulence in the ionosphere, 11.11–60
Turbulence theories, 11.11–254
Turbulence theory applications to wave propagation, 11.11–13
Turbulent diffusion from a continuous source, 11.11–136
Turbulent transfer of heat, 11.11–188
25 mb heights over Arctic, 11.11–119
Twilight airglow, 11K–6, 11K–27
Twilight emission lines, 11K–32
Twilight emission measurements, 11K–76, 11K–81
Twilight flash, 11K–70, 11K–117
Twilight intensity calculation, 11K–138
Twilight luminescence, 11K–5, 11K–100
Twilight luminescence spectra, 11K–124
Twilight observations, 11K–88
Twilight phenomena, 11K–124
Twilight radiation, 11K–73
Twilight sky brightness, 11K–82
Twilight sodium spectrum, 11K–26, 11K–54, 11K–99
Twilight spectra, 11K–62, 11K–96, 11K–115, 11K–120, 11K–121, 11K–127
Two-dimensional motion, 11.11–128
Typhoon "Billie" (1959), 11.11–153
Typhoon "Iris" (1959), 11.11–154
Typhoon charts, 11.11–158
Typhoon movement forecasting, 11.11–118, 11.11–149
Typhoon tracks, 11.11–158
Typhoons, 11.11–235

Ultraviolet night sky radiation, 11K–72
Ultraviolet radiation, 11.11–179
Ultraviolet radiation effects, 11K–61
Ultraviolet radiation measurements, 11.11–175
Ultraviolet spectra, 11K–18
U. S. satellite, 1958 Alpha (Explorer I), 11.11–39
U. S. satellite, 1960 Beta 2 (Tiros I), 11.11–85
Upper air circulation, 11K–48
Upper air sounding methods, 11.11–102
Upper air sounding techniques, 11.11–84
Upper air temperature measurement techniques, 11.11–280
Upper air wind measurement techniques comparisons, 11.11–217
Upper air wind pressure correlations, 11.11–231
Upper atmosphere, 11K–122
Upper atmosphere chemistry, 11K–93
Upper atmosphere emission, 11K–70, 11K–76
Upper atmosphere physics, 11K–20, 11K–43, 11K–63, 11K–132
Upper atmosphere structure, 11K–41

Valley winds, 11.11–207
Van Allen belts, 11.11–77, 11.11–83
Vaudaire, 11.11–206
Véronique rocket, 11K–142
Vertical instability, 11.11–234
Vertical motion-weather relationships, 11.11–218
Vertical sodium distribution, 11K–54
VHF radio wave propagation, 11.11–59
VHF radio wave scattering, 11.11–57, 11.11–64
Visual observations of night sky luminescence, 11K–50
Vorticity equations, 11.11–127, 11.11–129
Vorticity in typhoons, 11.11–149
Vorticity-typhoon track relationships, 11.11–149

Warm front analysis, 11.11–163
Warm front effects, 11.11–163
Warming of surface waters, 11.11–192
Water balance, 11.11–268
Water content of snow, 11.11–104
Water requirements for spraying, 11.11–269
Water supply, 11.11–248
Water supply for plants, 11.11–1
Water temperature variations, 11.11–172
Water temperature-wind relationships, 11.11–192
Wave action, 11.11–216
Wave propagation, 11.11–281
Weather radar calibration, 11.11–111
Wind effects on ocean currents, 11.11–122
Wind effects on silt deposition, 11.11–216
Wind shear probe, 11.11–205
Wind tunnel experiments, 11.11–205
Wine cellar microclimatology, 11.11–259

Zodiacal light, 11K–23
Zonal circulation variations, 11.11–40

INDEX OF GEOGRAPHICAL LOCATIONS

North Pole, 11.11–175
Western Hemisphere, 11K–30
Africa
Algeria
Tamanrasset, 11K–11
French Equatorial Africa
Gabon, 11.11–268
Madagascar, 11.11–144
Sahara
Reggane, 11.11–276
Asia
East Asia, 11.11–202
Far East, 11.11–255

Aden
Sirah Island, 11K–49
Formosa, 11.11–153, 11.11–154
India, 11.11–203
Japan, 11.11–125, 11.11–159, 11.11–234, 11K–58
Qatar, 11.11–214
Taiwan Sea, 11.11–204
U.S.S.R.
Alma-Ata Region, 11K–119
Armenian S.S.R., 11.11–11
Kazakh S.S.R.
Pskem River, 11.11–243
Maritime Territory, 11.11–215
Khanka Valley, 11.11–12
Siberia, 11.11–182
Transbaikal, 11.11–258
Ural Mountains, 11.11–82
Australasia
Australia
Melbourne, 11K–96
Europe
Alps, 11.11–166
Belgium
Uccle, 11.11–32
Czechoslovakia, 11.11–230
Bratislava, 11.11–173
France
Haute-Provence Obs., 11K–14, 11K–15, 11K–78
Strasbourg, 11.11–161
Germany, 11.11–253
Gollmberg, 11.11–115
Munich, 11K–45
Gibraltar, 11.11–200
Great Britain
England
Acklington, 11.11–240
Scotland
Wester Ross, 11.11–219
Hungary, 11.11–18
Tokaj, 11.11–259
Inn Valley, 11.11–256
Italy, 11.11–104, 11.11–231
Mediterranean, 11.11–155
Mediterranean Region, 11.11–117
Norway
Ås, 11K–74
Poland, 11.11–263
Rytro, 11.11–208
Romania, 11.11–249
Sweden, 11.11–180
Switzerland
Valais, 11.11–206
U.S.S.R., 11.11–80, 11.11–81, 11.11–212
Esthonian S.S.R.
Tartu, 11.11–80
Kursk Region, 11.11–183
Belgorod, 11.11–183
Latvian U.S.S.R.
Riga, 11.11–79
Leningrad Region
Lake Krasavitsa, 11.11–195
Moscow Region
Moscow, 11.11–78
Zvenigorod, 11K–120, 11K–123
Mt. Elbrus, 11K–118
Rostov Region
Tsimliansk, 11.11–195, 11.11–248
Ukrainian S.S.R., 11.11–164
Rymanów, 11.11–208
Yugoslavia
Slovenia, 11.11–166

North America, 11.11–189
Canada, 11.11–119, 11K–30
Northumberland Straits, 11.11–121
Manitoba
Churchill, 11K–86
Ontario, 11.11–157
Saskatchewan
Saskatoon, 11K–53, 11K–62, 11K–102
El Salvador
San Salvador, 11.11–238
Greenland, 11.11–191
United States, 11.11–146, 11.11–177
Southwestern United States, 11.11–236

Alaska
College, 11K–7, 11K–112
Fairbanks, 11.11–213
Arizona
Phoenix, 11.11–170
California, 11K–105
Sagehen Creek, 11.11–172
Searles Lake, 11.11–257
Colorado, 11K–79
Fritz Peak, 11K–106, 11K–111
Massachusetts
Dunstable, 11.11–229
New Jersey
Princeton Univ. Obs., 11.11–35
New Mexico
Sacramento Peak, 11K–80
New York
Ithaca, 11.11–65
South Dakota
Rapid City, 11K–81 11K–111
South America
Bolivia
Chacaltaya, 11K–23
Brazil, 11.11–17
French Guiana, 11.11–232
Oceans, Seas and Islands
Antarctica, 11.11–14, 11.11–20, 11.11–21, 11K–56, 11K–96
Adélie Land, 11K–32
Mirny, 11K–88
Vostok, 11.11–22
Arctic, 11.11–3, 11.11–15, 11.11–119, 11.11–244
Atlantic
North Atlantic, 11.11–167
Iceland, 11.11–210
Sargasso Sea, 11.11–194
Indian Ocean, 11.11–10
Pacific
North Pacific, 11.11–192, 11.11–193
Western Pacific, 11.11–158
Guam, 11.11–47

SELECT LIST OF PERIODICALS

Note: This list contains the titles of the periodicals which regularly contain material on meteorology or geophysics and it comprises only a small percentage of the periodicals from which pertinent articles are abstracted. The form of serial entry adopted is given in bold face type below.

Acta Geophysica Polonica, [Warsaw].
Acta Meteorologica Sinica, [Peking].
Akademiia Nauk SSSR, Izvestiia, Ser. Geogr. and **Ser. Geofiz.,** [Moscow].
American Geophysical Union, Transactions, [Washington].
American Meteorological Society, Bulletin, [Boston].
Angewandte Meteorologie, [Potsdam].
Annales de Géophysique, Centre National de la Recherche Scientifique, [Paris].
Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A and Ser. B, [Vienna].
Australian Journal of Physics, [Melbourne]
Beiträge zur Physik der Atmosphäre, [Frankfurt a. Main].
Ciel et Terre, Société Belge d'Astronomie, Météorologie et Physique du Globe, [Brussels].
Geofisica e Meteorologia, Società Italiana di Geofisica, [Genoa].
Geofisica Pura e Applicata, Istituto Geofisico Italiano, [Milan].
Geophysical Magazine, Japan Meteorological Agency, [Tokyo].
Hemel en Dampkring, [The Hague].
Időjárás, Magyar Meteorológiai Társaság and Országos Meteorológiai Intézet, [Budapest].
Indian Journal of Meteorology and Geophysics, [Delhi].
Journal de Mécanique et de Physique de l'Atmosphère, Société Météorologique de France.
Journal of Atmospheric and Terrestrial Physics, [London].
Journal of Geophysical Research, [Washington].
Journal of Meteorological Research, [Tokyo].
Journal of Meteorology, American Meteorological Society, [Boston].
The Marine Observer, Air Ministry, Meteorological Office, London.
The Meteorological Magazine, Air Ministry, Meteorological Office, London.
Meteorologické Zprávy [Prague].
Meteorological Society of Japan, Journal, [Tokyo].
La Météorologie, Société Météorologique de France, [Paris].
Meteorologiia i Gidrologiia, [Leningrad].
Meteorologische Rundschau, [Berlin].
Monthly Weather Review, U. S. Weather Bureau, Washington, D. C.
Polarforschung, Archiv für Polarforschung, [Kiel].
Przegląd Geofizyczny, [Warsaw].
Revista de Geofísica, Instituto Nacional de Geofisica, [Madrid].
Rivista di Meteorologia Aeronautica, Servizio Meteorologico, [Rome].
Royal Meteorological Society, Quarterly Journal, [London].
South Africa, Weather Bureau, Notos, [Pretoria].
Tellus, Svenska Geofysiska Föreningen, Stockholm.
Vsesoiuznoe Geograficheskoe Obshchestvo, SSSR, Izvestiia, [Leningrad].
Weather, Royal Meteorological Society, [London].
Weatherwise, American Meteorological Society, [Boston].
Wetter und Leben, Österreichische Gesellschaft für Meteorologie, [Vienna].
WMO Bulletin, World Meteorological Organization, [Geneva].
Zeitschrift für Meteorologie, Meteorologisches Observatorium, Potsdam.

TABLE OF CONTENTS

Meteorological and Geoastrophysical Abstracts, Volume 11, Number 11, November 1960

Foreword iii

Explanations iv

PART I. ABSTRACTS OF CURRENT METEOROLOGICAL AND GEOASTROPHYSICAL MATERIAL

General 1757
Collected Works 1757
Textbooks and Monographs 1760
Popular Books, Manuals and Atlases 1763
New Serials 1764
IGY—Arctic—Antarctic 1764
Conferences—Symposia 1765
Education—History—Biography—Bibliography 1765
Applications 1766
Aeronautics 1766
Agriculture 1766
Forestry 1766
Medicine and Health 1766
Industry 1766
Astronomy and Astrophysics 1766
General Astrophysics 1766
Solar Physics 1767
Planets 1770
Meteors 1770
Outer Atmosphere 1771
Cosmic Radiation 1771
Ionosphere 1773
Auroras 1778
Geomagnetism 1779
Van Allen Belt and Noctilucent Clouds 1781
Astronautics—Satellites 1783
Oceanography, Hydrology and Glaciology 1788
Oceanography 1788
Glaciology and Sea Ice 1788
Hydrology 1788
Meteorological Observations and Instruments 1789
Synoptic Analysis and Forecasting 1794
Atmospheric Structure and Physics 1797
Density and Composition 1797
Atmospheric Pollution 1797
Radio Meteorology 1797
Dynamics of the Atmosphere 1797
General Circulation 1802
Atmospheric Disturbances 1805
Radiation and Temperature 1811
Soil Temperature 1818
Pressure and Wind 1819
Turbulence 1821
Upper Air Winds 1825
Aqueous Vapor, Hydrometeors and Hydrometeorology 1826
Humidity, Evaporation, Condensation, Fog and Cloud 1826
Precipitation, Rain, Snow and Hail 1829
Hydrometeorology 1835
Climatology and Bioclimatology 1836
Climatic Changes 1837
Microclimatology 1838
Bioclimatology 1838
Miscellaneous 1841
Optical Phenomena 1841
Electrical Phenomena 1842
Acoustical Phenomena 1842

PART II. ANNOTATED BIBLIOGRAPHY ON NIGHT AIRGLOW, p. 1845–1877

PART III. RECENT MONOGRAPHS AND CONTENTS OF RECENT SERIALS AND COLLECTED WORKS, p. 1878–1900

PART IV. AUTHOR AND SUBJECT INDEXES

Index of Authors 1901

Index of Subjects 1905

Index of Geographical Locations 1912

List of Periodicals ..... Cover 3